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ALONG AND ACROSS THE GREAT WALL OF CHINA

By FREDERICK G. CLAPP

[With separate map, Pl. III, facing p. 248.]

On a cold winter's day, February 17, 1914, with the wind blowing a gale, through drifting sands which cut one's face like a knife, the exploration of the Great Wall of which these pages tell was started by three Americans.[1] We plodded across the country from Shanhaikwan towards the seashore, three miles distant, along the base of the Great Wall. With difficulty we gained its top and finally, though almost blown off, succeeded in walking along it for a mile or more to the Gulf of Liaotung (Fig. 2). Then we vaguely realized that we were standing on the oldest artificial structure we had even seen, and one of the oldest in the world. What an inspiration for a writer to tramp its "ten thousand li"[2] into Chinese Turkestan!

This was our first introduction to the Great Wall, and we unanimously declared it to be the most impressive landmark we had ever seen—not in its height or breadth alone, but in its length and continuity, and in the magnitude of the task which was successfully accomplished twenty centuries ago by a people whom we had hitherto ignorantly classed as an inferior race.

WHERE THE GREAT WALL MEETS THE SEA

The name Shanhaikwan signifies "Mountain-Sea Barrier," or "Between Mountain and Sea," a designation correctly describing the situation of the city three miles from the sea and about the same distance from the granite mountains, on a broad plain across which tens of thousands of Chinese,

[1] Besides the writer, there were in the party Myron L. Fuller, a prominent American geologist; Kenneth T. McKoy, a fellow citizen who had the fortune also to be a native of China, thoroughly versed in its language and customs; and also two newly made Chinese friends, Wu Kuei-ling and Ho Yen-sun, with all of whom we were destined to become closely acquainted during the succeeding year.

[2] The Chinese name Wan-li-ch'ang ch'êng signifies "ten-thousand-li-long rampart." The li is the Chinese mile, about one-third of an English mile.

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FIG. 1—The Great Wall (inner branch) at Nankow Pass, 35 miles northwest of Peking. The main trade route from Peking to Mongolia, in its ascent from the lowland plain on which the capital city stands, at this point crosses the first of the ranges which form the eastern scarp border of the Mongolian Plateau. (All photos, except Figs. 2, 6, 8, 14, 15, 18, 20, by the author.)

Mongolians, and Manchurians have marched and fought. The eastern wall of the city is coincident with the Great Wall of China, here penetrated by the famous gate known as Hsia-tien-ti-e-mên ("Under Heaven Number One Gate," or "The First Gate in the World"; Fig. 4). At this extremity the wall consists of a high earthen core coated on the outside with bricks.

From Shanhaikwan a pleasant day's excursion can be made along the Great Wall to the summit of Koku Shan, nearly 2,000 feet above the city. Practically all of the wall between the city and the top of the mountains—a distance of five miles—is still standing. The entire length consists of stone or brick steps averaging a foot in height and ascending at a gradient of from 30° to 60°. Aside from the wall, the mountain itself is interesting, since it is part of a great porphyritic range abounding in precipitous cliffs hundreds of feet high, in ancient temples scattered here and there on the hillside, and in extended views up the deep valley of the Koku River. A grand view of the Pei Shan range to the west, capped with snow and cloud, may also be had. Dotting distant prominences are seen watchtowers, relics of a time when China was well defended from the warlike northern tribes. Now, on the contrary, all is deserted, and only at the eastern end of the wall within a few miles of the sea does the presence of the several foreign military encampments—up to the war some foreign troops still remained from the occupation pursuant to the Treaty of Peking—suggest that the line is still of some military value.

Naturally the most noticeable feature in the view from Koku Shan is the wall stretching off southeast across the city of Shanhaikwan to the gulf, seven miles away (Fig. 3). The coast lines can be followed by the eye many miles to the southwest, and in the far distance can be seen the hills of Pehtaiho, the principal summer resort of the foreigners in Peking and Tientsin. Along the gulf a broad plain extends several miles back to the mountains, consisting of igneous rocks of remote geological age, which rise ridge beyond ridge to the south, west, and northwest, cut up by innumerable canyons.

The "Palisades," the Manchurian Extension

The line of defense known as the "Palisades" began on the Yalu River and connected with the Great Wall proper at an angle on the border between Chihli Province and Manchuria north of Shanhaikwan. This line is designated on some maps as a ruined wall. Since our geological expedition crossed it without seeing any structure, it is evidently not everywhere preserved. This wall is, however, delineated on certain maps as far north as the latitude of Mukden, 200 miles away, and there is historical record that it formerly extended in Manchuria at least 400 miles.

From Shanhaikwan to the Eastern Bifurcation

From Shanhaikwan the massive masonry and brick wall hardly maintains a uniform direction for a single mile. It climbs mountains, caps pinnacles, crosses valleys, and is on the whole so crooked that to reach the eastern bifurcation near Sihai, 125 miles west in an air line, where it branches, it takes a course of about 300 miles.

We had visited the Great Wall at Shanhaikwan in midwinter. Our

Fig. 2—The beginning of the Great Wall on the Gulf of Liaotung near Shanhaikwan. (Photo by K.T.McCoy.)

next view of it was at Kupehkow (Figs. 5 and 7) on a balmy day in April, when wheat was green in the valleys, spring vegetables were up, and fruit trees, violets, and dandelions were in bloom. About noon we caught sight of a long line of watchtowers on the crest of distant mountains; at two o'clock we arrived close to the wall in the valley of the Chao Ho and saw the frowning battlements, the watchtowers, and the long snakelike line of brick and stone winding up the hillside from crest to crest. The wall remained in sight nearly all day, its towers and battlements standing out in bold relief against the sky.

After nearly two months in the wintry climate and bandit-infested region of northern Chihli, we were as happy as our Chinese caravaneers to be again inside the wall. The difference in prosperity was especially noticeable. From the lowlands to the south in the vicinity of Miyünhsien and Hwaijowhsien the wall can be seen making great zigzags across the face of the gneissic Peita Shan, which rises nearly a mile high.

From the Eastern Bifurcation to the Hwang Ho

About 40 miles north of Peking, at an altitude of 3,300 feet, the Great Wall forks, the inner branch trending southwest to and beyond Nankow Pass, while the outer and more direct branch continues its mountainous way across western Chihli and the whole breadth of Shansi Province to the Hwang Ho (Yellow River). The distance in an air line from the eastern

FIG. 3

FIG 4

FIG. 3—The Great Wall stretching from Koku Shan, a mountain about five miles north of Shanhaikwan, across the lowland plain to the Gulf of Liaotung.

FIG. 4—The first gate in the Great Wall, which is also the eastern gate of Shanhaikwan.

FIG. 5—The Great Wall at Kupehkow, 65 miles northeast of Peking, from the valley of the Chao Ho.

bifurcation to the Hwang Ho is 380 miles; but the total length of this section of the wall, following meanders, is 500 miles.

The eastern bifurcation, or point of divergence of the inner and outer branches, appears very definite on the map, but in reality one or more cross walls exist in the fork. A few miles northwest of the main junction is the city of Sihai, once an important place but today almost a ruin. Though only 42 miles in a direct line from Peking, the city, lying behind a mountain range crossed by a difficult pass at 3,400 feet, is very inaccessible. It had not been visited by foreigners for two years.

An Unexplored Wilderness and Ruined Walls

The wall north of Sihai follows the mountain ridge and forms the inner boundary of an uninhabited wilderness more than 50 miles across, which the maps record as "unexplored." They are undoubtedly correct, since no magistrate or guide or "oldest inhabitant" in any of the villages visited was able to tell us of any route across it. After leaving Sihai we passed at least five ruins of ancient city walls, crumbling to decay after standing for twenty-three centuries. On prominent hills brick watchtowers (Fig. 9) and signal stations, equally ancient, are seen at intervals of a mile or two, all the way to Tushihkow. By them news was presumably flashed to the gates of the inner wall whenever the Mongols succeeded in breaking through the outer one. On the mountain tops to the north and east of the traveled route the turrets of the Great Wall were frequently visible.

Half a mile north of Shangpu, in the valley of a tributary to the Pai Ho an old wall crosses the valley in an east-west direction, but nothing more is known of it. On published maps the Great Wall appears on the mountain crest, close to the west of Lungmenhsien, but it was not seen at that place. Between Sihai and Kalgan the wall makes a sharp loop northwards. At the head of the loop lies the city of Tushihkow. Here, after crossing high mountain passes and traveling for days on narrow trails, we were back again on cart roads and at the end of another section of the journey. Tushihkow is a good-sized walled city just inside the Great Wall, on the main highway from Peking to Dolon-nor. Four miles northwest of that city the traveled road and the main valley cut the Great Wall, which there runs diagonally in a southwestern direction across mountains of basalt and metamorphic rocks at an elevation of nearly a mile above sea level.

On the Way to Kalgan

On the edge of the basaltic plateau of Mongolia, 15 miles by cart road north of Kalgan, is a spur or cross wall called the Piencheng trending east and west for several miles. Another of these spurs is mapped 15 miles west of Tushihkow and several others on the outside of the Great Wall west from Kalgan. They are doubtless more numerous than is known.

From the Piencheng to Kalgan the Great Wall itself is either closely adjacent to the highway or is visible on the mountains to the west. It is situated at an altitude of 3,000 to 6,000 feet on rugged basaltic flows capping great gravel beds.

The plateau over which most of the Tushihkow and Dolon-nor route lies is a rolling sand-strewn expanse of lava flows from which low hills occasionally rise. When the sand is not driving, the plateau resembles parts of Saskatchewan and North Dakota. Some portions make fine grazing country, on which herds of sheep, cattle, horses, and camels are seen (Fig. 10).

The descent from the plateau to the valleys below is canyon-like, and grand views could presumably be obtained in clear weather. The poor road becomes a great highway, lined for miles with mules, camels, and carts, transporting goods of various kinds into Mongolia (Fig. 11) and seeming to belie the statement, frequently made, that trade with Mongolia is at an end.

The Loess Country

Far from being clear, however, the day of our descent into Kalgan was one of China's "yellow days," during which the wind blows a gale and the air is full of a mist of fine particles, which, even in the best-built houses, sift in around windows and doors and coat everything with a thin film of yellow dust. This dust is from the famous loess (*huang-tu*) of northern China, a substance which makes this part of the country entirely different geographically and agriculturally from southern China. The dust storms, though a source of discomfort to the residents, are in reality the cause of widespread well-being, since they transport every year millions of tons of fertile loess from the plateaus of Mongolia to the cultivable lower lands of northern and central China.

The loess is a peculiar fine silt or loam hundreds of feet deep which covers vast areas of northern China.[3] The majority of the villages west of Chihli are built on the loess or in it, for the houses of many localities are simply caves dug in this remarkable formation. It lies from a few hundred feet above sea level to 7,000 feet above and generally presents a topography of sloping plains, miles in extent, intersected by canyons. Cultivation is largely limited to the loess.

Kalgan, the Gate to Mongolia

Kalgan (Mongol, *khalga*=pass) lies in a valley about 2,500 feet above sea level, between basaltic mountains rising 1,000 feet higher. Kalgan occupies a strategic situation on the road from Peking to Mongolia. In the Ming

[3] Regarding theories of origin and formation of the loess see Bailey Willis, Eliot Blackwelder, and R. H. Sargent: Research in China, Vol. 1 (Descriptive Topography and Geology). *Carnegie Instn. Publs. No. 54*, Washington, D. C., 1907, pp. 183-196 and 242-256.

FIG. 6

FIG. 7

FIG. 6—Gate in the Great Wall at Hsifengkow, Chihli, a village two miles east of where the wall crosses the Lwan Ho. (Photo by Myron L. Fuller.)

FIG. 7—A gate of Kupehkow with the Great Wall in the background.

Dynasty (fourteenth to seventeenth centuries) this place was an international market; under the succeeding Empire it was no less a place of great commercial and military importance, and today the camel caravans that start from Kalgan to cross the Desert of Gobi are among the largest in Asia. The wall at this place is 70 miles outside of the inner wall at Nankow. At Kalgan the wall extends along the ridge of hills in a nearly east-west direction and is very much in ruins except where it crosses the city and is kept in good repair. Many of the towers remain but are somewhat decayed.

FIG. 8—The Great Wall at Hsifengkow. See also Fig. 6. (Photo by K. T. McCoy.)

One afternoon, 35 miles west from Kalgan, in the center of the village known as Jih-erh-ling, we came upon a stone four feet in height, upon which was inscribed the statement that it marks the boundary line between the provinces of Chihli and Shansi. The stone, like many of the oldest structures, stands on a flat loess plain about 30 feet above the present level of the highway, which has been gradually worn down by weather and travel, until, with the modern houses by its side, it now lies in a valley of considerable depth. Many temples and old city walls are on elevated pinnacles or masses of loess, which they have protected from erosion, while the surrounding land has been worn away. Many of the highways have been deepened till they lie 50 feet or more below their former level.

IN SHANSI PROVINCE

The main traveled cart road west of Kalgan was out of sight of the wall for 60 miles on account of the looping of the latter to the north, but 10

miles inside of Shansi Province the wall is in plain sight along the Shuimokow Shan, which it follows for over 30 miles, though not all the way on the mountain crests. Continuing west, it makes several loops, passing some 20 miles northwest of Tatungfu, the last telegraph station on the route west, a place of about 250,000 inhabitants, who are crowded within walls a little less than one mile square.

The Inner Wall From the Eastern Bifurcation to the Hwang Ho

From its junction with the main wall 40 miles north of Peking, a massive

Fig. 9—Old watchtower at Sihai, near the eastern bifurcation of the Great Wall.

line of wall extends southwest with many deviations past Nankow Pass to a point on the border of Shansi and Chihli, thence west and northwest to the junction with the outer wall 30 miles east of the Hwang Ho. The total length of this inner wall, following meanders, is about 400 miles. It is not everywhere preserved, though throughout Chihli Province it is very massive and prominent.

This part of the Great Wall was visited by the writer twice by train in the spring of 1914, and next, on donkey back, in April, 1915. Unlike most trips in China, this is a regular excursion for tourists in connection with the trip to the Ming Tombs. It is only 11 miles from Nankow by rail, up a deep and narrow mountain valley which reaches an altitude of 2,000 feet above sea level, at the end of which the Great Wall itself is encountered, in places at least 3,500 feet above sea level (Figs. 1 and 13).

Nankow, "The Southern Pass"

The railroad station at Nankow is one mile from the walled town, a small

place that, before the days of the railroad, subsisted on caravan traffic to and from Kalgan. Most of the buildings in Nankow are inns. The place has, however, lost its former prestige since Monnier in 1895 described the stream of traffic continuously passing through it on the great commercial road to the north. "There, from year's end to year's end, day and night, pass the loads of wool and furs going down from Mongolia to Peking, and bricks of tea from Tientsin for Kiakhta, on the Siberian frontier."[4]

Nankow means "Southern Pass." The Peking-Kalgan railway approaches it through the "Defile of Chüyung," about 13 miles long. At the lower end it is wild and gloomy, bounded by towering crags, scarcely leaving room for the stony torrent and the railroad; and it has consequently always been a point of strategic importance. There are five subsidiary walls for the protection of the pass, the first of these being the wall and adjoining forts of Nankow, while the other walls are lower down.

About five miles from Nankow is the almost uninhabited village of Chüyungkwan, which, nevertheless, has walls and fortifications four miles in extent and boasts its full share of history, being on the Imperial Road and having proved a barrier to the siege of Jenghis Khan. Here the Imperial Road passes under a fine octagonal marble gate, known as the Kuochieh Ta (Tower Which Crosses the Street), in which are carved figures from Hindu mythology and a multitude of Buddhas. On the gate are inscribed two religious inscriptions dating from 1345 A. D. in six languages or characters, Sanskrit, Tibetan, Mongolian "in Phag's-pa lama characters," Turk-wigur, Hsi-hsia (Tangut), and Chinese.[5] At a number of places in the vicinity inscriptions in Sanskrit, Tibetan, and Manchu are carved on the rocks.

The Southern Branch Wall

Extending south from the inner wall near the Wutai Shan in eastern Shansi Province, forming the border between Shansi and Chihli for over 200 miles, is another branch wall. This wall is seldom well preserved but extends in some form as far as the latitude of Shuntehfu, a distance, following meanders, of 230 miles, and one detached remnant has been reported 40 miles farther south.

The Frontier Wall Along the Northern Edge of Shensi

On the left bank of the Hwang Ho, between Shansi and Shensi Provinces, the wall is continued 40 miles southward; thence it runs southwest to the western side of the great loop of the Hwang Ho, defining first the boundary between Shensi and the Ordos Desert of Inner Mongolia, and in

[4] Marcel Monnier: L'Empire du Milieu, 1895.

[5] Translations of these inscriptions were made by various writers. They are quoted in Madrolle's guidebook to "Northern China," London and Paris, 1912, pp. 71-72.

FIG. 10—Camels grazing; road from Kalgan to Dolon-nor.

FIG. 11—Carts hauling stores to Mongolia, Han-nor-ba, 15 miles north of Kalgan, on road to Urga.

FIG. 12—Camel caravan at Laoyehmiao, Chihli, 10 miles southwest of Kupehkow.

the western 60 miles of this course part of the boundary between Kansu Province and Mongolia.

The Ordos Desert

In Shensi Province the wall was first seen by us on June 17, after three days' traveling, near Shenmuhsien. The scenery had been grand all day. In the evening, as we approached the Niuchwan Ho and looked off to the north, the Ordos Desert, a part of the great Desert of Gobi, was seen for the first time, and we realized that Clark and Sowerby's description[6] is most appropriate:

> The country . . . . . is wild and inexpressibly dreary. Very few trees are to be seen, and the bare brown cliffs and yellow sand are devoid of any vegetation, save an occasional tuft of some sage scrub. In places, especially where, as in the northeast, it rises to any prominence, gloomy chasms, with deadly quicksands lurking in their depths, gape in the sandstone and the half-formed shale. To north and west the prospect is heartbreaking. Sand-dunes and sand-dunes and again sand-dunes shifting with every storm and obliterating every landmark. Only here and there, as tiny islands in a sea of desolation, small clusters of mud huts, where some little oasis marks the site of a spring or well.

Conquests of the Desert

All published maps record this wall as the "Great Wall." At Shenmu, however, the natives said: "This is *not* the Great Wall; this is the 'First Frontier Wall,' built only four hundred years ago; the 'Great Wall' is farther north." And they added that the "Second Frontier Wall" lies about 30 miles beyond the present frontier, and the "Great Wall" a long way beyond that. History furthermore appears to corroborate the local tradition that the ruins of the real Great Wall lie buried in the desert sands somewhere in the Ordos. Their exact location makes an interesting archeological and historical problem. The past greatness and prosperity of the region is attested by numerous walled cities, ancient buried or ruined highways, and the frequent presence, under the sand dunes, of a rich soil which must have constituted a great fertile valley in some distant period. On this region the northern sands have been encroaching, passing one wall after another, and are now far beyond the southernmost one, relentlessly conquering a once prosperous country on which the fiercest Mongol onslaughts were of little avail.

From Shenmuhsien we followed the Frontier Wall, here an earthen wall, for three days into Yülinfu, over a trail said never to have been traveled by foreigners. We journeyed much of the time across the rolling sandy waste 5,000 feet above the sea which comprises the edge of the desert. On the hills many temples, watchtowers, and the remains of the Frontier Wall (Figs. 16 and 19) testified to the former importance of the region. Now

[6] R. S. Clark and A. de C. Sowerby: Through Shên-kan. London and Leipsic, 1912, p. 22.

the region is almost deserted. This was not the Dolon-nor type of desert, in which enough grass frequently grows to make good grazing and on which villages occur at intervals. The Ordos Desert consists of nothing but hills and valleys of sand, hot and soft, that was driven all day into our faces by a stiff wind (Fig. 15); and there is little vegetation except small scrub on some of the hills. One day we passed through the city of Changlopu,

FIG. 13—The inner branch of the Great Wall at Nankow Pass. (See also Fig. 1.)

which is so rapidly being buried that one must climb over the walls on sand dunes in order to enter (Figs. 17 and 18).

YÜLINFU, AN OASIS OF THE ORDOS DESERT

On the sixth day west of the Hwang Ho we passed a large temple and entered the main gate of Yülinfu, when a wonderful transformation met the eyes. Not a trace existed of the exterior inhospitable scenes; but above the thousands of neat housetops which lay below us we gazed across a broad and green valley, through which flows the Yülin Ho, making a scene as picturesque as could be desired (Fig. 21). Descending the hill we entered the main street, lined with crowds as usual, but the busiest since leaving Tatungfu, as Yülinfu is one of the large cities of China. Yülinfu is comparable with Kupehkow, Kalgan, and Tatungfu in its geographical importance. It is the center for trade between the Chinese of Shensi and the Mongols of the southern Ordos Desert. The chief products of its markets

FIG. 14—The mountains along which the inner branch of the Great Wall lies (to be made out along the crest leading up to the peak in the left background), seen from near Hsiangyangkow, a village on the Hun Ho, three miles south of the wall and 20 miles southwest of Nankow Pass. Notice the road in the foreground, worn down by travel in the loess, a peculiar fine silt or loam sometimes hundreds of feet deep which is derived from the deserts of Mongolia and covers vast areas of northern China. (Photo by F. A. Herald.)

are hides, skins, wool, hair, blankets, shoes, socks, etc.; like Kalgan it is noted for its horse fairs. The name Yülinfu means "Elmwood Prefecture" and would appear to indicate that the city was named at a time when elms were abundant, before the sands of the Ordos Desert had overrun the region. At present thin grass, sagebrush, and a few willows constitute about the only natural vegetation.

On the eastern side the desert sands have been piled high against the city wall, affording an easy entrance to belated travelers who may arrive after the closing of the gates for the night.

The Frontier Wall and the Great Wall

At Yülinfu a talk with the high commissioner, a well-educated man, who has traveled outside of China, confirmed our theory that the wall now forming the northern boundary of Shensi and designated as the

"Great Wall" on all maps is in reality the "Frontier Wall," built about the fifteenth century of our era, while the true Great Wall, built over two thousand years ago, is situated perhaps a hundred miles farther north, near the Hwang Ho, in the Ordos Desert. The intervening country was once extremely prosperous and had a large Chinese population, but now its habitable portions contain only Mongolians.

Since the true Great Wall seems to be beyond our knowledge, so far as the Ordos Desert section is concerned, we must use the Frontier Wall for our estimates of length. The distance across the great loop of the Hwang

FIG. 15.—Sand dunes at the edge of the Ordos Desert near Yülinfu. Camel caravan in left background. (Photo by E. L. Estabrook.)

Ho in a straight line is 250 miles, and the length of the Frontier Wall is 350 miles.

THE DESERT LOOP

The city of Ningsiafu, in northeastern Kansu Province, is 4,000 feet above sea level, at the corner of the Great Wall where the latter turns at an angle of almost 90° and thence trends southwest. Northeast of the city are three arms of the wall extending towards the Hwang Ho.

Now, after having visited Ningsiafu, the writer is at as much of a loss as are the published maps regarding the course of the wall in the first 30 miles west of the northward course of the Hwang Ho. The impression exists that there is a gap west of Ningsiafu but that the main Great Wall is continuous for a few miles farther north along the Ala Shan on the border of Kansu and Mongolia. The distance in a direct line from the known portion of the wall west of Ningsiafu to the western bifurcation at

Tatsing is 160 miles, but the length of this section of the wall is close to 250 miles.

The portion of the Great Wall from Ningsiafu to Liangchowfu has been christened by Geil the "Desert Loop."[7] It is largely within the Province of Kansu but for a part of the distance forms the boundary of Mongolia along the Hsi or Ala Shan. The country outside the wall here is included in the Desert of Gobi. The greater part of Geil's route in this section lay across a monotonous stretch of sand where deserted villages were numerous. The second city in importance along the Great Wall is Liangchowfu, which is said by Geil to contain a total population of 20,000 families.

The Main Loop of Kansu

In the Province of Kansu there is an inner wall about 250 miles in length, which branches from the Great Wall at Chungwei on the Hwang Ho, thence trending south along the river and following the western bank for over 100 miles to beyond Lanchowfu. There, where the river makes a sharp bend, the wall turns northwest along the Pingfan Ho for nearly 100 miles; it then bends north and east at the pass Wushao Ling, where it reaches its greatest elevation, about 9,900 feet above sea level, and again joins the main wall at Tatsing. From Hungcheng to a point north of the Wushao Ling the wall follows the great highway that connects Lanchowfu with Kashgar. The entire inner loop of Kansu is, according to Geil, in ruins and grass-covered.

The Tibetan Loop

The name "Tibetan Loop" may not be strictly correct, since the wall does not touch the true boundary of Tibet, but the term is retained here because the wall extends far in that direction. This loop is about 400 miles in length. It leaves the main Kansu loop at Lanchowfu, rejoining it again near Kulang, north of the Wushao Ling.

Kumbum, on the Tibetan Loop, south of Siningfu, is about 30 miles from the Tibetan border. This city is, next to Lhasa, the most important lamasery in the world, being the home of 3,600 lamas and a favorite resort of pilgrims. The Wall here is variously known as Pien Cheng (Boundary Wall), Chang Cheng (Long Wall), and Wuling Cheng (Five Ranges Wall), the latter signifying that it passes over five ranges of hills.

Siningfu is situated inside the Tibetan Loop on the gentle slopes of the Nan Shan foothills, overlooking several fertile valleys. It has high, massive brick bastions and battlemented walls and is entered through strong gates, the east gate having an enormous porteullis. The city has temples, official buildings, barracks, and several modern schools. Borax, rhubarb, musk, antlers, wool, furs, and fish from the beautiful Koko Nor (lake) are imported from Tibet.

The Tibetan Loop apparently was discovered by Henry French Ridley,

[7] W. E. Geil: The Great Wall of China, Shanghai, 1909, pp. 176-193.

"the hero of Sining" during the Mohammedan rebellion of 1895-1896. This loop appears on no published map except that accompanying Geil's volume and that drawn for the present paper. While it is not of great antiquity, it is believed by scholars to lie on the line of an ancient wall of great size dating from the Chin Dynasty.

The Wall in the Panhandle of China

The remaining undescribed section of the wall proper is that in the "panhandle" of Kansu Province. It leaves the Kansu loop at Tatsing and follows in a general way the border of Mongolia for 350 miles, continuing thence to Chiayükwan, a total distance of 450 miles (air line distance 320) from Tatsing, and protecting on the north the cities of Liangchow, Kanchow, and Suchow. Liangchow is described as an attractive city, but many of the city walls near the line of the Great Wall northwest of the city are mere skeletons, containing neither population nor buildings. The Great Wall in this portion was doubtless once veneered with brick and stone, but only a loess core now remains.

The city of Kanchow, though on the line of the Great Wall during Marco Polo's visit, has now been moved seven miles south. The region in which it lies is a rich agricultural one, producing wheat, pears, beans, melons, and hemp. It is famous, too, as the home of the world's rhubarb stock. In the days of Marco Polo Kanchow had three Christian churches but now has only one.

Suchow, the northwesternmost city of China proper, is situated 5,053 feet above the sea, at and very near to the western end of the Great Wall. It is a place of 4,000 families and is famous for its production of jade.

End of the Great Wall in China Proper

Twenty-three miles west of Suchow is Chiayükwan, the western terminus of the Great Wall. Just outside of Chiayükwan is a stone tablet, bearing an inscription signifying the importance of this outermost post of defense on the great military barrier.

According to Geil, however, the real end of the Great Wall is not at Chiayükwan but five miles southwest of it on the banks of the Tapai Ho (Big White River) and in sight of the mountains of Tibet. Not a sign of human life exists in this desolate spot. The wall stops short at the brink of a precipice 200 feet high, below which flows the great river. The color of the stream is in great contrast to that of the Hwang Ho, this river being the product of melting snows in the neighboring mountains of Tibet flowing through limestone, while the Hwang Ho derives its sediment largely from the finely disseminated loess.

The Great Wall in Chinese Turkestan

Although Chiayükwan may be the western end of the Great Wall of

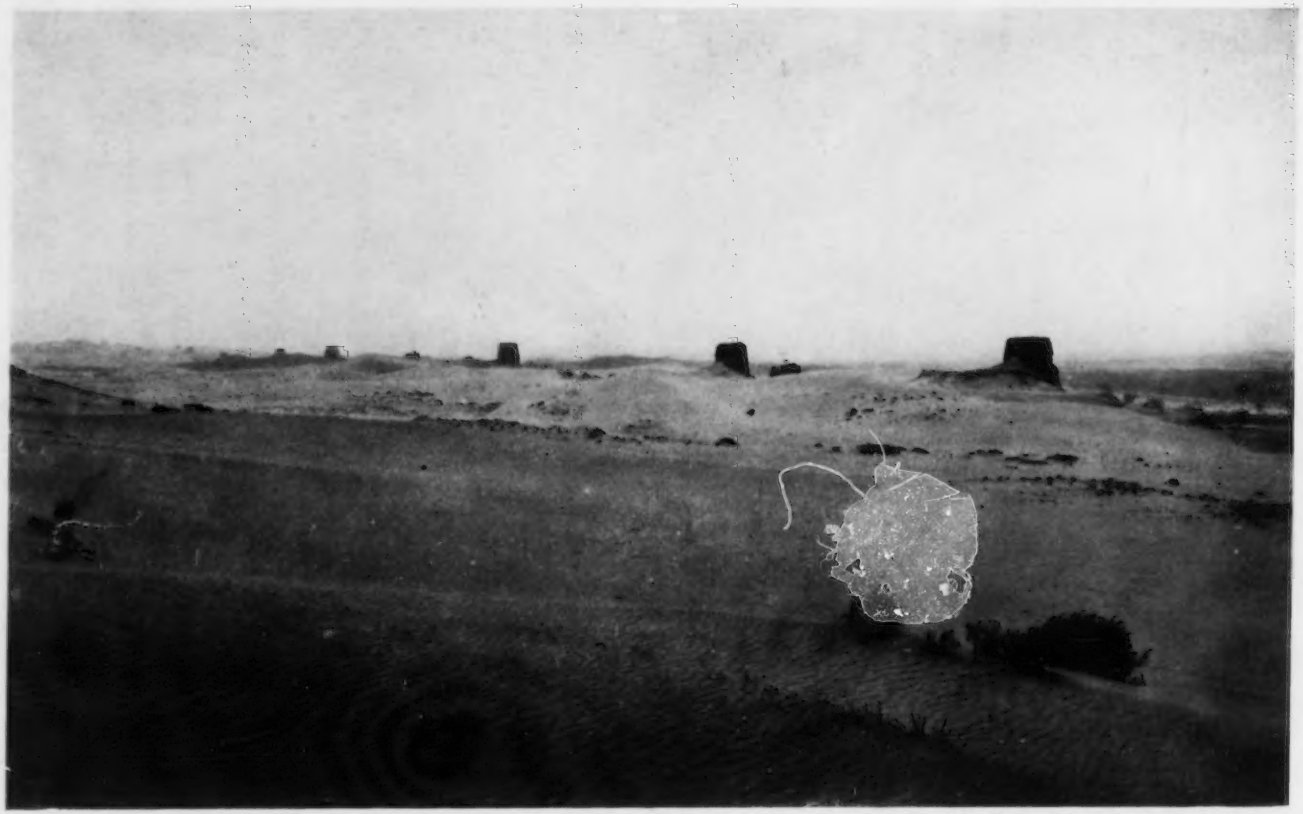


FIG. 16—Towers of the "First Frontier Wall," constituting the boundary between Inner Mongolia and the Province of Shensi, seen from Changlopu near Yülinfu. The wall is here being buried gradually by the sands of the Ordos Desert.

FIG. 17—The city of Changlopu, 12 miles northeast of Yülinfu, which is rapidly being buried by the sands of the Ordos Desert.

Fig. 18—A temple and the city wall at Changlopu buried by the desert sands. (Photo by E. Day.)

built during the reign of Wu Ti (140-87 B. C.) of the Han Dynasty. The regular garrisoning of the wall continued through the first century before Christ and, over the greatest part of the wall's length, down to the second century of our era.

Dr. Stein ascribes the main purpose of this frontier wall to the necessity of guarding from the Hsiungnu, a nomadic tribe of Huns who lived in the Mongolian desert, "the territory south of the Sulo Ho, which was indispensable as a base and passage for the Chinese Military

China, as commonly recognized, it is certainly not the western end of the Great Wall system, as other stretches forming part of the same general military system are known in the desert sands beyond. The first person to show that the Great Wall does not end at Chiayükwan was Dr. Aurel Stein,[5] who visited Central Asia in 1901 and on his second trip, in 1906-1908, traced ruins of ancient frontier walls to a point about 250 miles west of Chiayükwan, or an additional wall length of at least 300 miles. According to authentic records these walls were

Fig. 19—Looking southwest along the First Frontier Wall from inside a ruined watchtower near Kaokiapu, 30 miles northeast of Yülinfu.

[5] M. A. Stein: Explorations in Central Asia, 1906-08, *Scottish Geogr. Mag.*, Vol. 26, 1910, pp. 225-240 and 281-293.

forces, political missions, etc., sent to the Tarim basin'"[9] on the eastern edge of the Takla-makan Desert in the Lop-nor region. Stein collected a great number of documents from watchtowers, sentry stations, temples, etc., along the wall. He pays a just compliment to the Chinese engineers for their skill in the selection of the proper course for the wall, which in this section was uniformly 8 feet thick and about 12 feet high, with the usual watchtowers rising to 30 feet or more. In some places just inside the wall the ancient tracks worn during centuries by the feet of patrols are still visible as a furrow 20 feet inside the wall.

FIG. 20—Ruins of the First Frontier Wall 3 miles north of Kaokiapu. Horizontal sandstone.

Stein observed this wall on the southern side of the Sulo Ho at Anhsi, and on the northern side of the Sulo Ho for 50 miles east, and at a point 95 miles northwest of Chiayükwan. He also maps it 50 miles west of Anhsi at a point 25 miles north of Tunhwanghsien, where is situated his famous cave of temples known as the "Halls of the Thousand Buddhas." Farther west the wall is mapped on the southern side of the Sulo Ho to about 75 miles west of Tunhuang. In intermediate places the wall is in ruins or was not seen. The last observed watchtower was 280 miles due west of Chiayükwan, and we do not know how far the Great Wall extended west through the desert of Kum-tagh.

[9] M. A. Stein, *op. cit.* p 238.

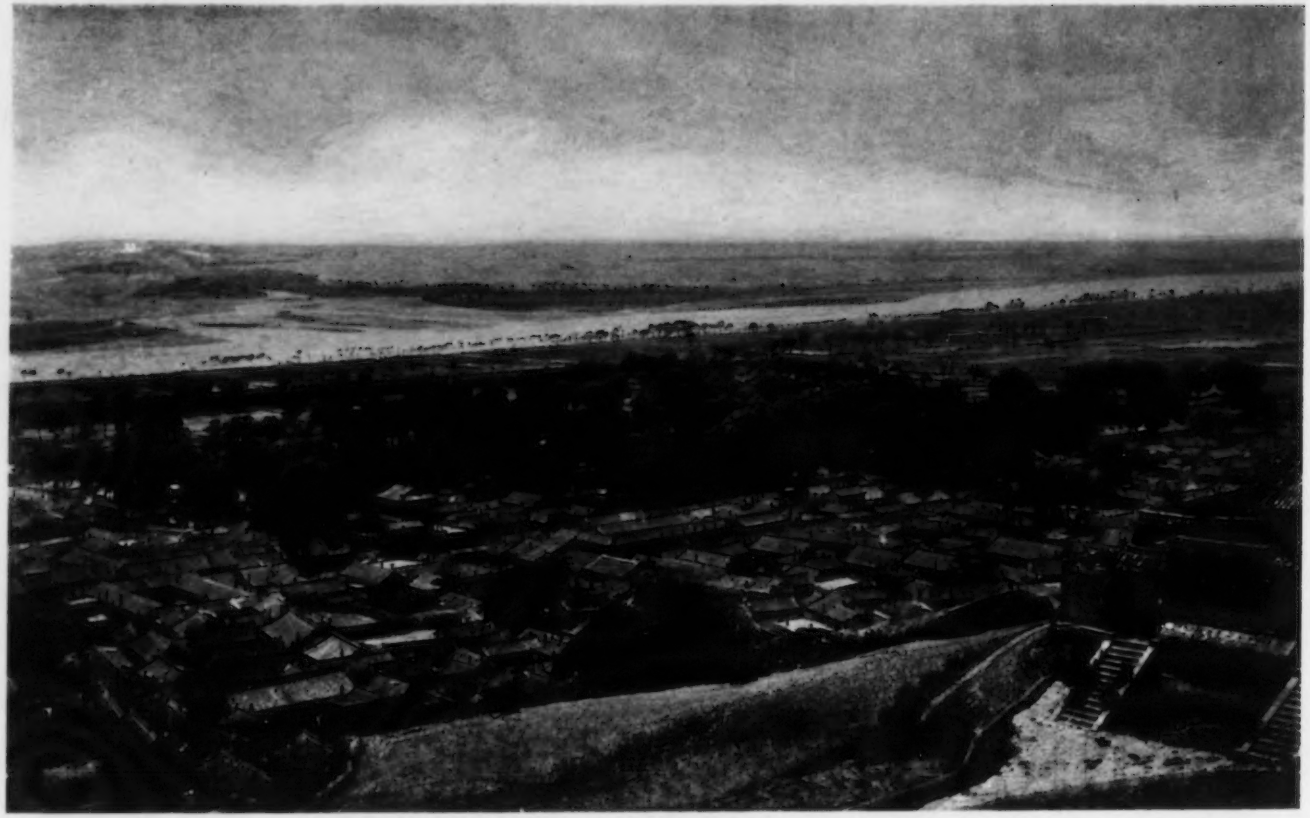


FIG. 21—Yülinfu, northern Shensi. The city, which lies just within the First Frontier Wall, is the center of trade with the Mongols of the southern Ordos Desert.

Length of the Great Wall

The length of the wall in its entirety may now be considered. The total length estimated by various authorities is:

Chinese legend	10,000 li (about 3,333	miles)
Li Ung-bing[10]	1,500	"
W. E. Geil (without branches)	1,250	"
" " " (with branches)	2,500	"
F. G. Clapp (without branches)	2,150	"
" " " (with branches)	3,930	"

The details of the wall, summarized according to the estimates of the present writer, are:

Great Wall Proper

Shanhaikwan to eastern bifurcation	300	miles
Eastern bifurcation to Hwang Ho	500	"
Frontier Wall along northern Shensi	350	"
Ningsiafu to Liangchowfu	250	"
In "panhandle" of China	450	"
In Chinese Turkestan	300	"
Total	2,150	"

Branches and Loops

Manchurian extension	400	miles
Inner Wall from eastern bifurcation to Hwang Ho	400	"
Southern Branch Wall	230	"
Main loop of Kansu	250	"
Tibetan Loop	400	"
Miscellaneous branches	100	"
Total	1,780	"

Summary

Great Wall proper	2,150	miles
Branches and loops	1,780	"
Total	3,930	"

The Building of the Great Wall

Little has been written on the Great Wall in a comprehensive way, and for that reason many misapprehensions exist as to its position, extent, state of preservation, history, etc. In the first place, one must not suppose that

[10] Li Ung-bing: Outlines of Chinese History, Shanghai, 1914.

the Great Wall is a structural unit, or that it was constructed all at one time. A number of separate walls, dating back several centuries, had been constructed bordering on the domains of the Hsiung-nu before the reign of the so-called "First Emperor," the tyrant Hwang-ti, who buried alive hundreds of scholars and burned nearly all the books of the Empire. One of the separate walls, for instance, was built as early as the year 469 B. C. by

FIGS. 22 and 23—Views of the Great Wall at Nankow Pass to illustrate the method of its construction. In places the top of the wall is level enough for an automobile, as in Fig. 13; but in others it consists of massive flights of steps, as in Fig. 22.

Prince Chung-shan.[11] The "First Emperor" (246-210 B. C.) in reality united and strengthened the existing walls. The building of new walls, however, did not cease with the emperors of this dynasty. There is no doubt that during the past 2,200 years the Chinese have built more than a dozen Great Walls of as many varieties of construction.

Furthermore, it is evident from the tablets which are frequent along the Great Wall that repairs were made from time to time. For instance, the wall was repaired in the reign of Hsien-Tsung (1470 A. D.) of the Ming Dynasty, and 200 miles more were added in 1547 A. D. Some repairs were made as late as the beginning of the Ching (Manchu) Dynasty, since when no attempt has been made to keep the wall in repair.

[11] Edouard Chavannes: Les plus anciens specimens de la cartographie chinoise. *Bull. Ecole Française de l'Extrême Orient*, 1903, pp. 221-222.

Method of Construction

The height of the Great Wall is not uniform throughout its extent. It averages 22 feet but varies from 20 to 50 feet; the base is 15 to 25 feet thick, and the top 12 feet or more; in places the wall is solid and level enough to support an automobile; but in others it consists of massive flights of steps. At intervals averaging 600 feet are towers 40 to 60 feet high, formerly used as sentry stations for the protection of combatants and as vantage points in fighting.

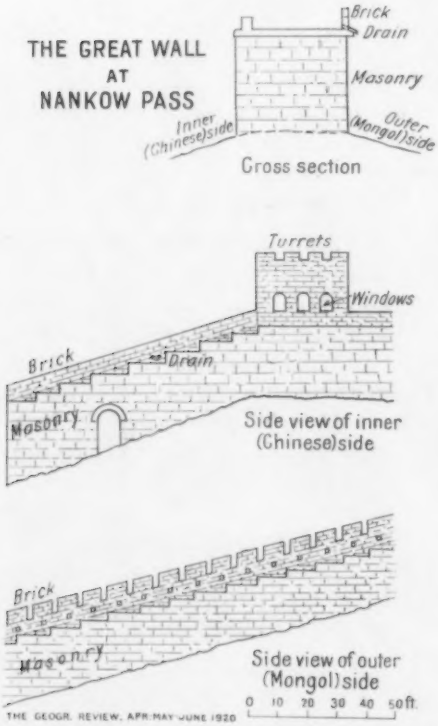


FIG. 24—Cross section and side views of the Great Wall at Nankow Pass.

The entire eastern section and that at Nankow Pass are built of massive masonry and huge bricks and are mostly well preserved; but farther west the wall is much less substantial, has fallen in many places into decay, and in Kansu Province resembles a large mud bank. In places it was constructed of earth, in others of brick or stone; and in some parts the towers are in far better state of preservation than are the intervening portions of the wall. In many places tablets (generally consisting of a lengthy enumeration of the officials in charge of the work) are placed to record the construction or repairs to the wall. Certain indications found in the brick work, in legends and in tablets, indicate that in some parts the towers were built first and then the walls constructed between them.

In many parts of Shensi and Shansi the character of the loess formation is such that it can be simply cut out into the form of a wall—which plan in reality was very effective. The material was simply split down vertically and then faced with stone. A moat bordered the wall through parts of these sections. In other places the wall had to be built up of loess, above

the plain. A wooden framework was constructed; the loess was thrown in, watered, and rammed; then the framework was removed, leaving the wall fully constructed. Even where built of loess the wall, in spite of long neglect, is generally distinctly traceable between the towers.

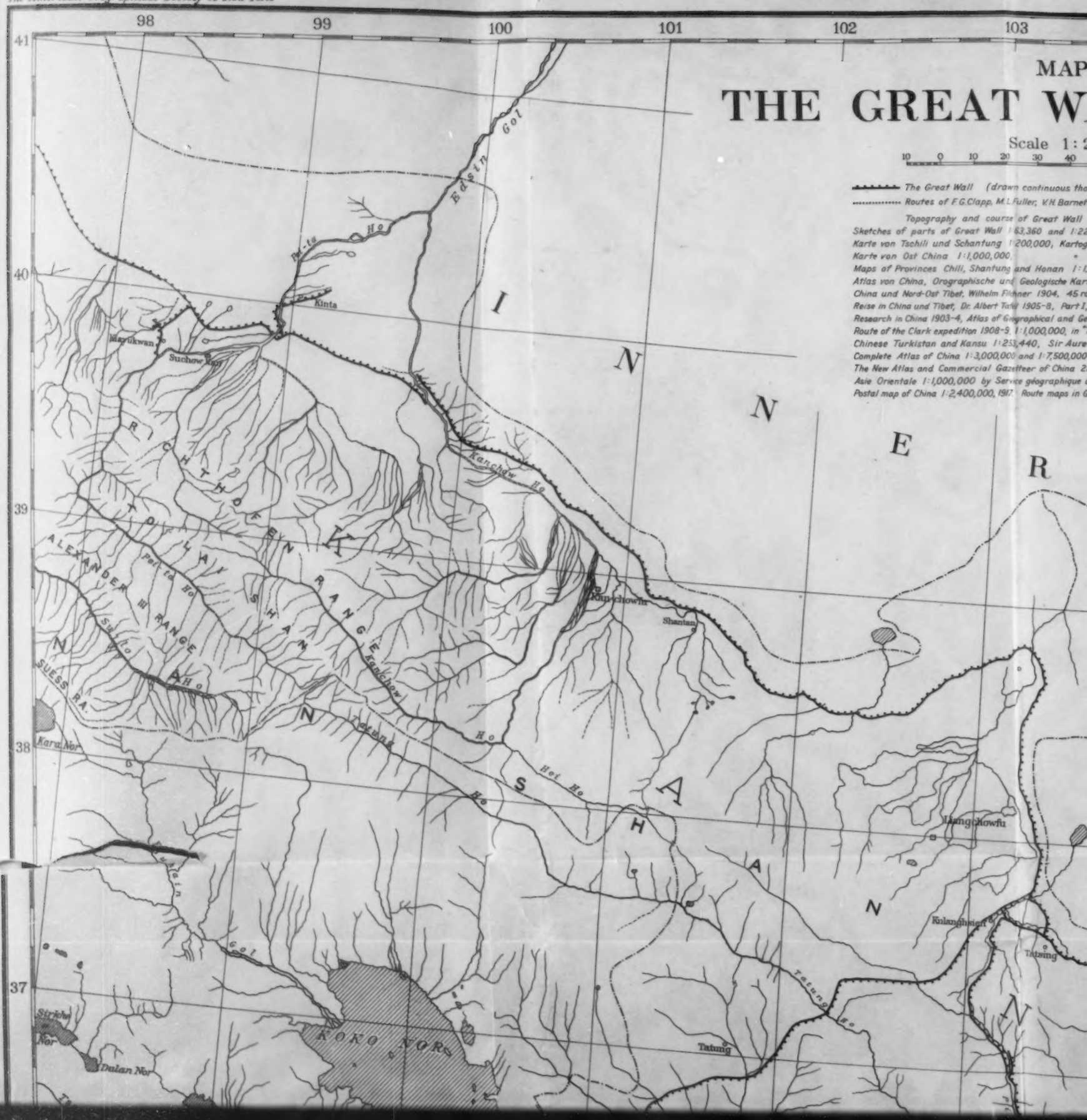
Wall Structure at Nankow Pass

The Great Wall at its best can be judged from the section at Nankow Pass (Figs. 1, 13, 22, 23), where it was well constructed, is in an excellent state of preservation, and is typical of the eastern arm extending to Shanhaikwan, a distance, following meanders, of over 300 miles. The cross section and side views at Nankow Pass are shown in Figure 24.

At Nankow Pass, and generally in the mountains, the wall is composed of granite blocks for a height of 20 feet above its base, the blocks being five feet long and one foot square, set in two parallel furrows cut 25 feet apart in the solid rock. The blocks are not rough stone but are accurately cut and have evidently been hauled long distances from the quarries. Some blocks are as much as 14 feet long by 3 or 4 feet thick. The upper part of the wall is composed of bricks, some as much as 22 inches long, others 14 inches square and 3½ inches thick and, as has been said, of better quality than most brick made at the present day. We do not know how the heavy bricks were transported from place to place across the almost impassable mountains; but one legend says they were dragged by goats. The mortar that holds the bricks together is better than the Chinese can make at the present time. The Chinese have great faith in it as a medicine and allege wonderful cures with certain prescribed mixtures.

At intervals of a few hundred feet are doorways leading to the inner (Chinese) side and steps leading to the top, so that soldiers could easily ascend to defend it against invasion. Every few hundred feet are the watchtowers, 30 to 40 feet square and 40 feet or so in height. The towers were carefully numbered by the builders, as, for instance, "Tower No. 55 of the Black Letter Wu Series." The top of the wall in the Nankow section is a roadway 14 feet wide. At intervals of 50 to 100 feet are stone drains to allow rain water to run off the roadway, and the foresight thus shown has helped its preservation.

The engineers who laid out the wall seem to have generally selected strong lines of defense, such as mountain crests and narrow gorges. It is easy to understand the heavy fortifying of the passes and plains, though not so easy to judge the reason for so uniformly fortifying the mountain crests. Huge permanent garrisons were quartered in fortified camps behind the wall. When not fighting, the soldiers engaged in agricultural pursuits, in which they were encouraged by the government through a system of land grants.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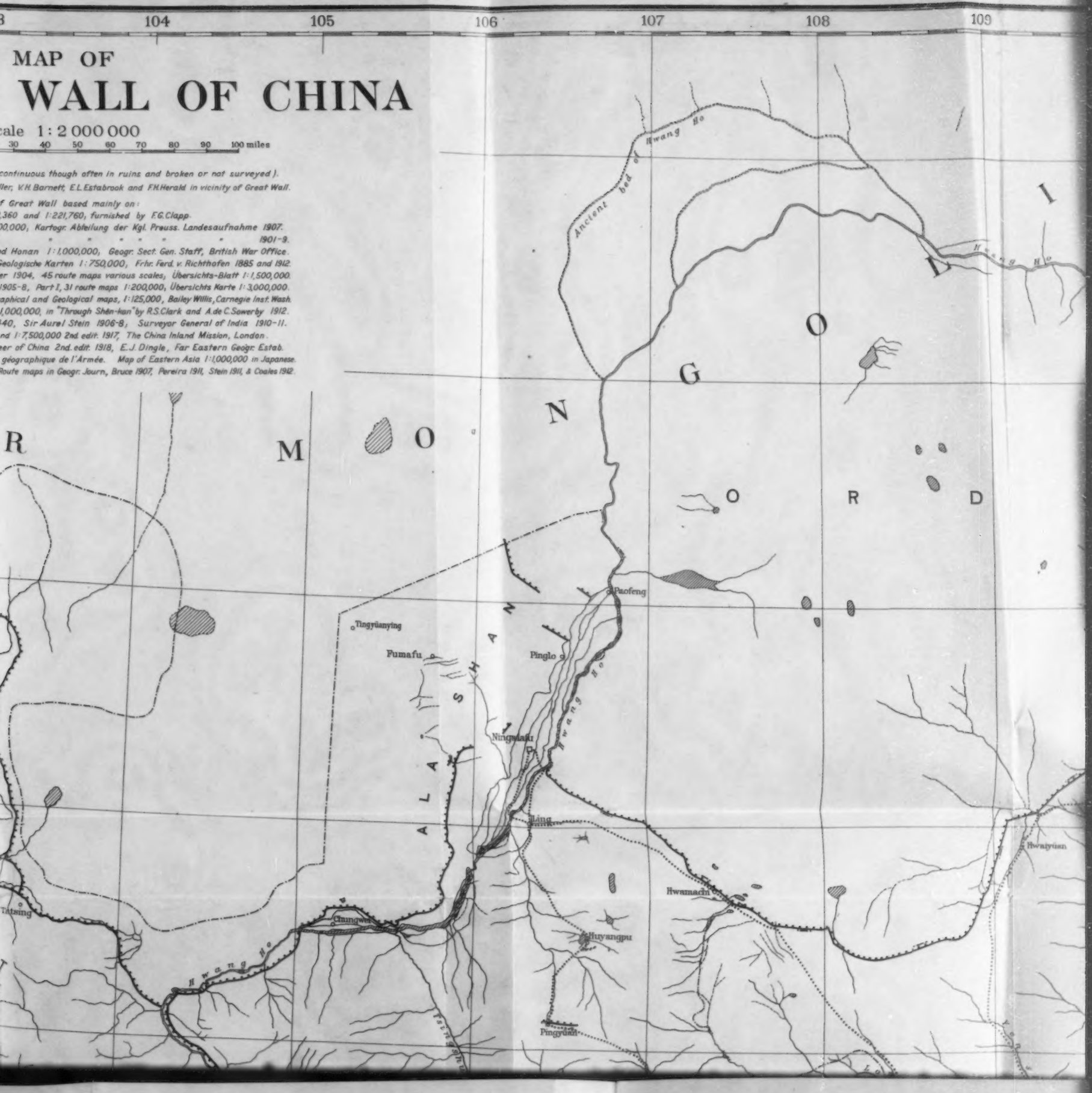
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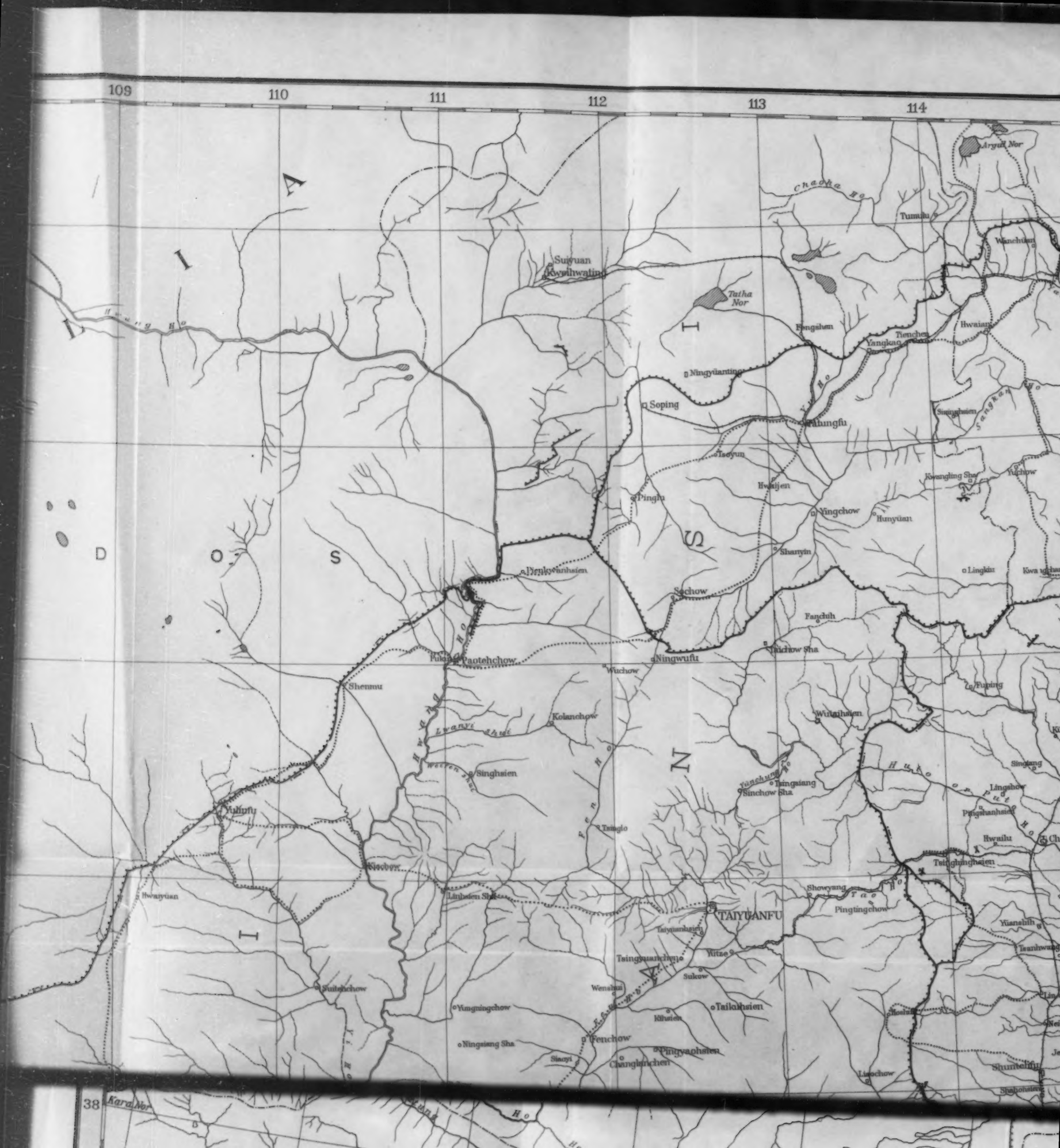
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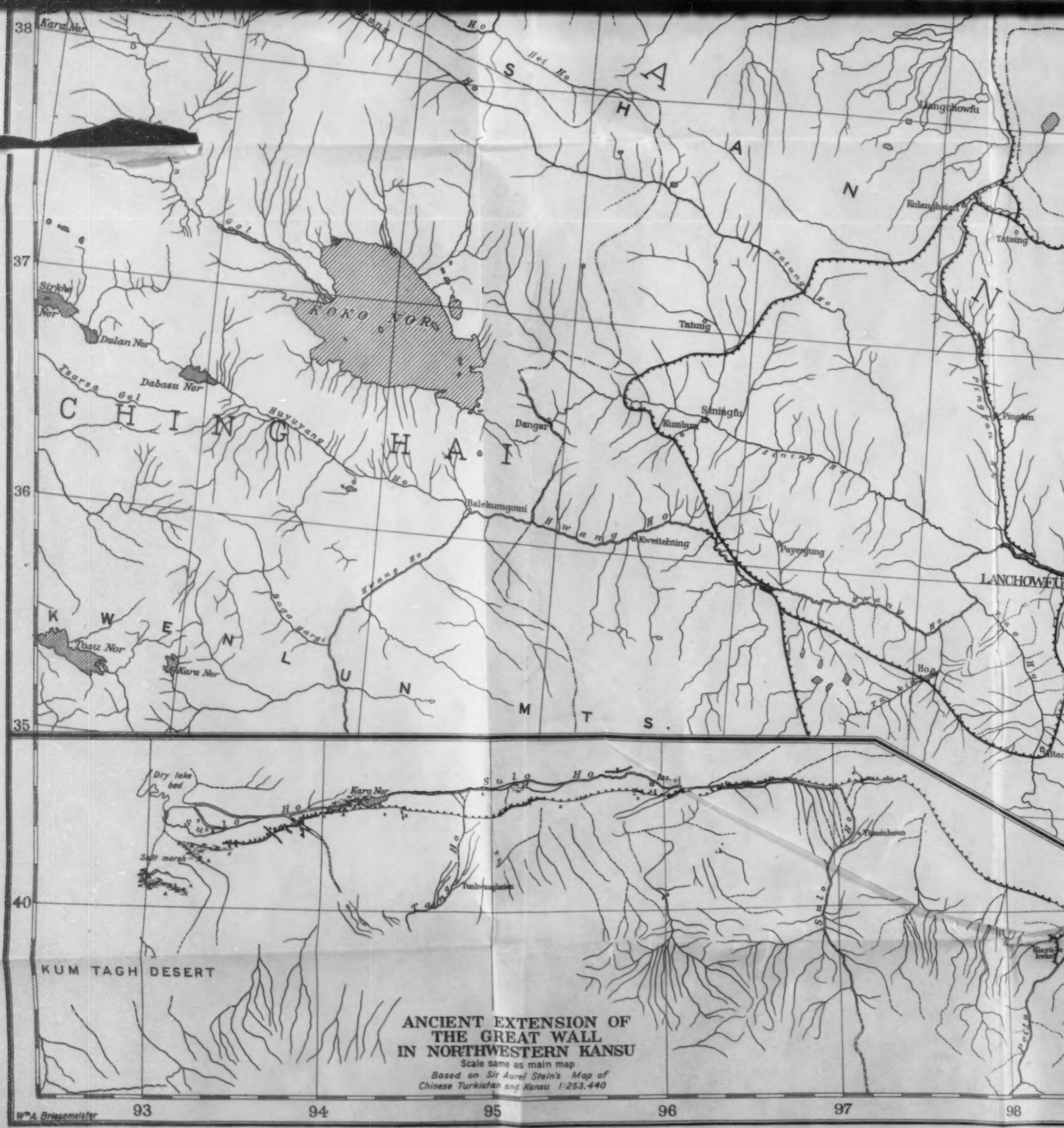

ANCIENT EXTENSION OF THE GREAT WALL IN NORTHWESTERN KANSU

Scale same as main map

Based on Sir Aurel Stein's Map of Chinese Turkistan and Kansu 1:253,440

Wm A Briesemeister

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ALAS
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Pingyuan
Chungwei
Hwang Ho
Tsingshui Ho
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Kanyuan
Kingyang
Chengyuan
Tungchi
Ningchow
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Tsingningchow
Pingliang
Kingchow Kan
Hwating
Chungsin
Kungchangfu
Changhsien
Fuklang
Tsingyang
TSINGSHUI
Tsinchow
Suchow
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Lingtai
Lungchow She
Kienchow
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Sanyuanhsien
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Chungpu
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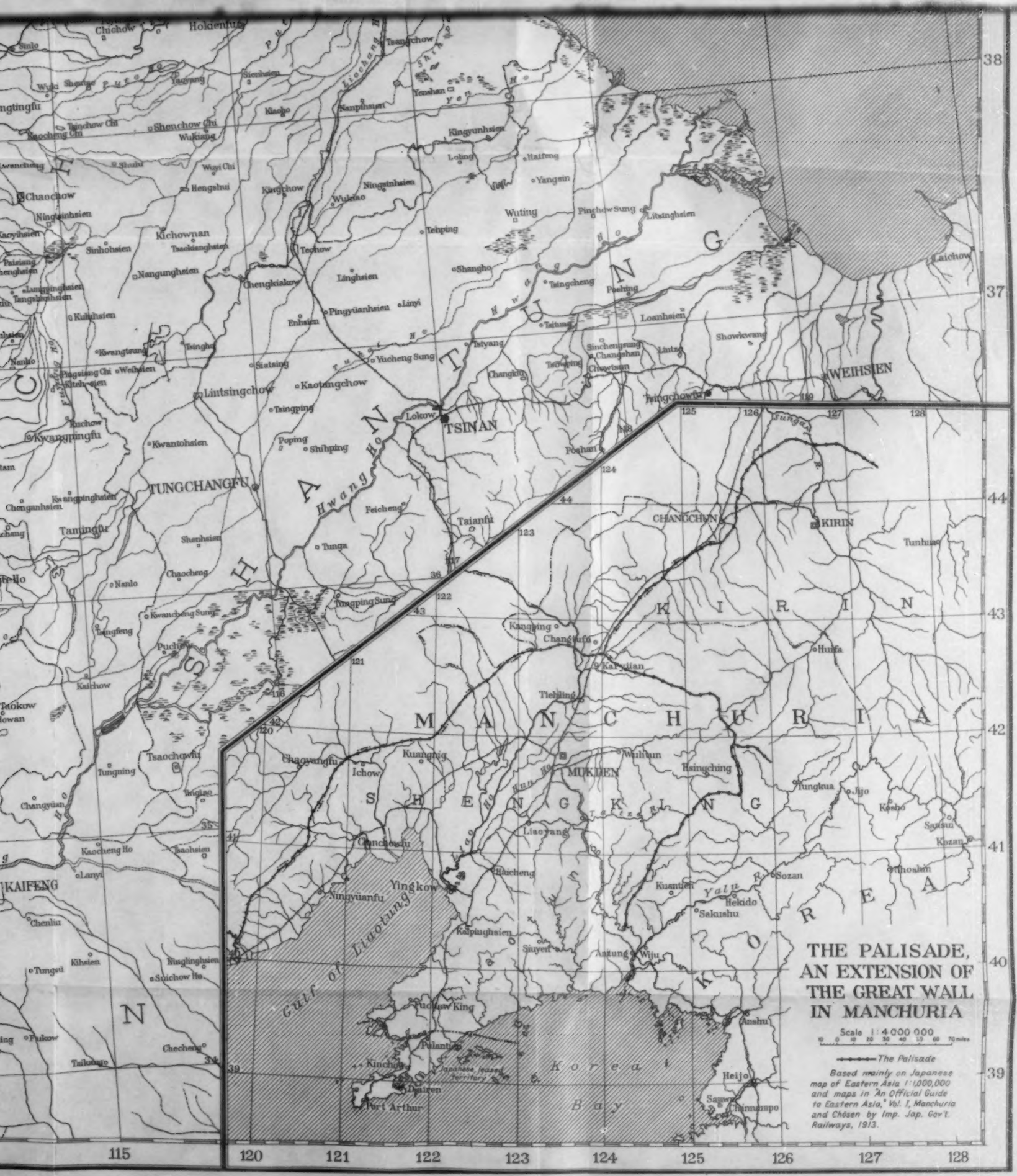
THE PALISADE, AN EXTENSION OF THE GREAT WALL IN MANCHURIA
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Dairen
Kinchow
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Tungping Sung
Kwancheng Sung
Tsingfeng
Puchow
Kaichow
Taokow
Kwangtsungfu
Kwantohsien
Tsinghsien
Siatsing
Yucheng Sung
Lintsingchow
Kaotangchow
Tsingping
Poping
Shihping
Enhsien
Pingyuanhsien
Linyi
Kuihsien
Nanko
Fingsiang Chi
Weihsien
Kiehsien
Tsaochowfu
Tungming
Changyuan
Kaocheng Ho
Taohsien
Lanyi
Kaifeng

The "Great Wall" of the Future

The Great Wall is no longer needed; it has served its purpose. The protection it afforded against Mongol and Hun consisted not only in its substantial masonry or piled loess, but in its wonderful continuity, in the alertness of its defenders, in its system of watchtowers and signals, and above all in its expression, concrete and symbolic, as a barrier boundary beyond which no invader could come without incurring the wrath and vengeance of an infuriated people.

One foe alone has not been stopped by the Great Wall. This is the sand of the Desert of Gobi that is driven by wind and climatic conditions southward mile after mile, year after year. Owing to the winds and the deforestation of the country, which may be called China's most serious mistake, the desert will continue to move southward and in a few thousand years render large portions of Shensi uninhabitable. Is there no remedy for this condition? The writer believes there is. A new Great Wall should be constructed, not of brick or stone or earth guarded by soldiers, but a forest barrier guarded by expert foresters. A forest one mile wide along the northern border of the country would probably suffice; in Shensi, at any rate, the project is feasible. Irrigation, too, would assist in reclaiming the desert. Here at least is a vision to encourage Occidental democracy.

OUR AQUATIC BIOLOGICAL RESOURCES

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Introduction

Civilization is dependent upon water—the sea, rivers, lakes, ponds, streams, and marshes touch every aspect of human life. Much attention has been given to water supply for drinking and domestic purposes, to water power, and to the carrying away of filth and waste from the innumerable operations that are an essential part of modern civilized life. These things are so important and so involved in traditional and vested property rights and the convenience and profits of modern industry that an entire series of important natural aquatic resources has been crowded aside and almost forgotten. These are:

(a) Animal resources: fish, turtles, frogs, mussels, shellfish, and aquatic birds and mammals;

(b) Plant resources: aquatic vegetation, stream-skirting shrubs and trees, providing feeding and nesting places for important animals;

(c) Museum resources: preserves of aquatic and riparian faunas for future scientific investigation and for possible practical uses;

(d) Recreational resources: bathing, rowing, camping, angling, shooting;

(e) Esthetic resources.

The preservation of these resources often conflicts with those more generally recognized. Much has been written on the subject of the balance in nature, but little attention has been given to it even in quasi-biological circles. The tendency has been rather to "improve" and "develop" our water resources, including stream and lake margins, as well as roadsides and right-of-ways,[1] without reference to the requirements of animals and plants originally dependent upon natural conditions and of recognized value to mankind. Furthermore, there is reason to believe that the value of the biological products of our coastal and inland waters and water margins has been underestimated.

First, the monetary values assigned such products in census reports have, for some items, been too small. The occasional character of the investigation has been productive of inaccuracy. Only those products which have actually been shipped through market channels have been counted; the local and private supplies often, if not usually, have been omitted.

In 1908 the fisheries products of the United States, exclusive of whales but including mollusks (oysters, etc.) and sponges, were valued at upward

[1] W. L. McAtee: Attracting Birds to Public and Semipublic Reservations. *U. S. Dept. of Agric. Bull. No. 715*, 1918.

of $53,000,000. Of this sum about $7,000,000 is to be credited to inland waters. Frogs, turtles, terrapin, alligators, and fur-bearing animals were valued at $500,000. The value of frogs for the entire United States (1908) was $42,000, while $15,000 were reported from Oneida Lake (New York) alone, which covers only 80 square miles (1916). Turtles and terrapin are given a value of $122,000, while the Louisiana Conservation Commission reports $100,000 to $110,000 a year for Louisiana alone (1917). There may have been increased catch, increased prices, but not sufficient to account for the differences indicated. In general the state census bureaus, which operate continuously, make larger estimates than the federal bureau.

Second, the real value of aquatic resources has been depreciated by erroneous comparisons. As a rule only fishes, which make up the smaller part of the total, get consideration. Their value is small after pollution and overcatch have reduced their numbers. It has been argued that the fisheries of one of the most productive rivers are not worth as much as the products of the smallest industry that throws waste matter into it. This argument carries much weight with legislatures. It is, however, faulty and untenable. First of all, the values used for fish are their value to the fisherman. The Alaska salmon-canning industry shows[2] that the value of the fish to the fishermen is about one-third the value of the canned product to the canneries. Fish and other aquatic products should be compared with *raw materials* and not with the products of factories on which much labor has been expended.

Value of Biological Resources

Fresh-Water Fishes and Mussels

The most prized fresh-water fishes and mollusks are dependent upon clean bottoms, abundant vegetation, and a good flow of water in dry seasons —conditions which characterized our streams in primeval times.[3] Clearing of timber has modified stream flow, stream margin shade, etc., detrimentally. Household and industrial effluent dilution has modified the character of the water and covered the bottoms with filth, to the destruction or injury of fishes and their associates.[4]

In the settlement and early development of our country, fishes were very important. There were shad, salmon, trout, bass, alewives, eels, and many other kinds. They furnished a plentiful supply of healthful food, easily

[2] B. W. Evermann: Alaska Fisheries and Fur Industries in 1913, *U. S. Commission of Fish and Fisheries, Report for 1913*, Appendix II, pp. 1-139.

[3] V. E. Shelford: Animal Communities in Temperate America, *Bull. Geogr. Soc. of Chicago No. 5*. Chicago, 1913.

[4] V. E. Shelford: Fortunes in Wastes and Fortunes in Fish, *Scientific Monthly*, Vol. 9, 1919, pp. 97-124; *idem*: Ways and Means of Measuring the Dangers of Pollution to Fisheries, *Bull. Illinois State Nat. Hist. Survey*, Vol. 13 (2), 1918, pp. 25-42.

attainable, until the forests could be hewn down and crops raised.[5] Shad was the most important variety and was abundant in all Atlantic coast rivers. In Pennsylvania the country folk came from fifty miles away to get their winter supply, camping along the rivers and bringing in payment whatever they had of a marketable nature.[6] Now shad, together with salmon, is greatly reduced in Atlantic coast streams. In the Illinois River years ago the buffalo fish afforded the chief marketable species. In recent years it has constituted less than eight per cent of the total fish catch.[7] Buffalo-fish eggs are unusually sensitive to various unfavorable influences. The whitefish of the Great Lakes, which served as bread, meat, and vegetable to the early explorers and settlers, was once abundant.[8]

Ruthless catching has been followed by sewage, and sewage by industrial wastes.[9] Lead works, zinc works, tanneries, paper mills, and gas plants[10] turn valuable and extremely poisonous substances into the streams and lakes. In Europe nearly all industrial wastes have been converted into something useful.[11] In America manufacturers have not cared to spend time and energy in dealing with the matter.

The extent of the damage done by pollution at the present time may be judged by the fact that 60 per cent of the suggestions concerning the improvement of fisheries and the increase of the product during the war dealt with pollution. The condition of streams in America is worse than in Europe mainly because Europeans have been giving attention to the matter while we have neglected it.[12]

Fresh-water mussels for making pearl buttons constitute an important resource. It is one which is decreasing, however, from overcatch and pollution which destroys the fish upon which the mussels depend.[13] In 1908 the value of the mussels taken from the Mississippi and its tributaries was estimated at $686,000.[14]

Marine Fisheries

The marine fisheries of the United States in 1908 had a value of about $45,000,000. The sea and its shallows are highly productive of human

[5] Harrison Wright: On the Early Shad Fisheries of the North Branch of the Susquehanna River, *U. S. Commission of Fish and Fisheries, Report for 1881*, pp. 619-642.

[6] W. E. Meehan: The Battle of the Fishes, *Canadian Fisherman*, Montreal, Vol. 4, 1917, pp. 275-277.

[7] This information was supplied by Mr. R. E. Richardson.

[8] F. N. Clark: A Plan for Promoting the Whitefish Production of the Great Lakes, *Bull. U. S. Bur. of Fisheries*, Vol. 28, 1908, Part I, pp. 635-642.

[9] M. C. Marsh: The Effect of Some Industrial Wastes on Fishes, *U. S. Geol. Survey Water-Supply Paper 192*, pp. 337-348.

[10] V. E. Shelford: An Experimental Study of the Effects of Gas Waste Upon Fishes, with Especial Reference to Stream Pollution, *Bull. Illinois State Laboratory of Nat. Hist.*, Vol. 11, pp. 382-412, Urbana, 1917.

[11] Theodor Koller: The Utilization of Waste Products (translated from second revised German edition), London, 1915.

[12] H. B. Ward: The Elimination of Stream Pollution in New York State, *Trans. Amer. Fisheries Soc.*, Vol. 48, 1919, pp. 3-25.

[13] R. E. Coker: The Protection of Fresh-Water Mussels, *Bur. of Fisheries Doc. 793*, 1914.

[14] The Fisheries of the United States in 1908, U. S. Bureau of the Census, Washington, D. C., 1911.

food, including fish, shellfish, crustaceans, trepang, etc.;[15] it has been said that four square feet of ocean will support a human life.[16] The cultivated mussel beds of Conway produce 8,600 pounds of flesh per acre, while the productivity of land in beef is about one-ninth of this. The dry mussel flesh is about six-tenths of the dry organic matter produced in grain from the same area of land. Investigation of the possibilities of food culture of the sea should be greatly extended; our knowledge barely exceeds that of the savage. There are many marine animals not ordinarily eaten which are excellent food.

The supply of lobsters, cod, and many other fish decreased markedly soon after the beginning of the industrial period in New England. This was in part due to overcatch and to the damming of rivers, as stated before, but pollution of the seas was no doubt an important factor also. It is probable that pollution of the sea affected runs of herring and had an important influence on the decline of the Baltic cities in the fourteenth century and on the rise of Amsterdam.[17] In fact, marine animals of economic importance require pure water, clean bottoms, and natural vegetation. Practically all changes accompanying settlement are detrimental to the best food species. The sea is large, but marine animals are much more sensitive than fresh-water animals.

Fishways

For the proper protection of fishes and mussels fishways, fish elevators, etc., are needed in connection with river improvements. In the North Branch of the Susquehanna, in Pennsylvania, "the shad industry was wholly abolished by the erection of dams to feed canals (early in the last century), and thousands of dollars of capital invested in the business was instantly swept out of existence."[18] The canals have been quite generally abandoned in recent years. Experience with such improvements raises the question of their permanent value.

The best type of fishway[19] is the stream itself, and the aim should be to reproduce stream conditions so far as current is concerned. A cost equaling half the cost of the dam is not too much to expend to accomplish the desired result. Fishways have usually been added to completed dams as a sort of cheap adjunct after the fishes have already been depleted from several years of failure to migrate. The importance of fishways is well

[15] James Johnstone: Conditions of Life in the Sea, Cambridge, 1908; see especially pp. 178-205.

[16] I. A. Field: The Ultimate Sources of Marine Food, *Trans. Amer. Fisheries Soc.*, New York, Vol. 45, 1916, pp. 177-190.

[17] John Yeats: The Growth and Vicissitudes of Commerce in All Ages, London, 1887.

[18] Work cited in footnote 5.

C. G. Atkins: On Fish-ways, *U. S. Commission of Fish and Fisheries, Report for 1872-73*, Part II, pp. 591-616.

[19] Hector Von Bayer: Fishways, *Bull. U. S. Bur. of Fisheries*, Vol. 28, 1908, Part II, pp. 1043-1057.

illustrated by a statement by Coker[20] relative to the Mississippi dam at Keokuk, Iowa, which runs as follows: In their early stages of development pearl-button mussels are parasitic on particular species of fish. Conditions which affect the movements of the river herring, which is the host of the niggerhead mussel, and the catfish, which is the host of the pimpleback mussel, may vitally affect the welfare of these important mussels. If the river herring is checked by the interposition of a dam, so that comparatively few find the way into the upper river, two results will follow: (1) the fish will become a rare species in the upper river, and (2) the mussels will become extinct in that portion of the Mississippi River lying above Keokuk —that is in practically the entire mussel-producing portion.

The usual "custom" in such matters will probably be followed here. There will be no fishway until in time we discover that damage has been done, and then the fisheries will not be worth the making of one. In 1908 the fisheries of the Mississippi and its tributaries in Iowa, Minnesota, northern Illinois, and Wisconsin had a total value of more than $500,000.[21] The value of mussels and pearls alone was almost $100,000. If an annual $600,000 fisheries project is endangered, why could not such a sum reasonably be expended for a suitable fishway?

It is doubtful if any salmon stream should ever be dammed without a fishway costing the full annual value of the fish, if necessary. Salmon were exterminated in the Connecticut River by a dam built in 1798. This also shut out shad and alewives. The value of the shad fisheries of the Delaware about this time was $200,000 per year. With salmon and alewives included, the Connecticut fisheries should have more than double this. An expense of ten per cent of the annual value of the fisheries could have constructed a fishway quite adequate for all the fish. The very large one in the Susquehanna built in 1873 cost only $11,053. It probably paid to build this dam in 1798, but whom did it pay? Certainly not starving Europe in 1918.

In general river engineers have taken little or no notice of either fishes or fishways. In 1872 Professor Baird[22] said of the cod fisheries: "Formerly the waters abounded in this fish.... The tidal streams were choked up with alewives, shad, and salmon. The erection of impassable dams across the streams, by preventing the ascent to their spawning grounds, produced almost the extermination of their numbers. The reduction in the cod and other fishes so as to become practically a failure is due to the decrease off our coast in the quantity of alewives, and secondarily of shad and salmon, more than any other cause."

[20] R. E. Coker: Water-Power Development in Relation to Fishes and Mussels of the Mississippi, *U. S. Commission of Fish and Fisheries, Report for 1913*, Appendix VIII, pp. 1-8.

[21] Work cited in footnote 14.

[22] S. F. Baird: Conclusions as to Decrease of Cod-Fisheries on the New England Coast, *U. S. Commission of Fish and Fisheries, Report for 1872-73*, Part II, pp. xi-xiv.

Frogs, Turtles, and Crustaceans

The swamps and marshes near all the large cities produce quantities of frogs, but the numbers and values are unknown. The legs are used for food. This constitutes the frog's chief value, but many are used in scientific laboratories. Fifteen thousand dollars' worth are secured annually from the margins of Oneida Lake, N. Y.[23] It is safe to say that this value in frogs is produced on 1,500 acres of shore and shallow water, which means a yield of $10 per acre without cultivation; and this is only one of many products and values for the same area.

Frogs, like all other animals, must have proper conditions for successful reproduction and growth. The bullfrog requires cool, deep waters and margin shrubbery under which to rest out of water. Other smaller species have definite shore and breeding-water requirements.

Turtles live about lake and river margins and deposit their eggs on land, some in dry sand, some in moist mud, some in decaying vegetation. They are very sensitive to disturbances of their breeding grounds and accordingly decrease as the country is improved. Crayfishes are, as a rule, eaten only by our foreign population but have a distinct value on the market.

Birds

North America possesses about two hundred species of game birds which are associated with watercourses, lakes, swamps, and the seashore.[24] This number includes 74 species of edible web-footed fowl. Sixteen of these have been shown to feed upon wild rice, wild celery, and pond weeds.[25] These three plants supply an average of 25 per cent of their food, more than half of which consists of pond weeds which grow well in waters not too badly polluted. These birds are all closely dependent upon water for breeding.

Ducks eat quantities of grasshoppers, locusts, cutworms, and marsh caterpillars. The rails and coots have similar habits and relations. All are useful to the farmer. There are some sixty species of long-legged slender-billed birds, the so-called shore birds.[26] These devour quantities of mosquitoes, horseflies, etc., both adult and larval. Nearly all these birds are very fond of grasshoppers, and many feed on weevils, wireworms, leaf beetles, and other pests of the field. Many birds associated with water are useful to agriculture, and their destruction ultimately results in heavy

[23] Charles C. Adams and T. L. Hankinson: Notes on Oneida Lake Fish and Fisheries, *Trans. Amer. Fisheries Soc.*, Vol. 45, 1916, pp. 154-169.

[24] E. H. Forbush: History of the Game Birds, Wild-Fowl, and Shore Birds of Massachusetts and Adjacent States, Mass. State Board of Agric., Boston, 1912.

[25] W. L. McAtee: Five Important Wild-Duck Foods, *U. S. Dept. of Agric. Bull. No. 58*, 1914; *idem:* Eleven Important Wild-Duck Foods, *U. S. Dept. of Agric. Bull. No. 205*, 1915.

[26] W. L. McAtee: Our Vanishing Shorebirds, *U. S. Bur. of Biol. Survey Circular No. 79*, 1911: also work cited in footnote 14.

losses to the farmer through the increase of insect and other pests. These are also the birds hunted for food and for sport.

Mammals

The small fur-bearing mammals closely associated with watercourses—beavers, muskrats,[27] skunks,[28] and minks—are valuable for their fur. The skunk is counted as a useful animal and is fond of stream-margin thickets. Its bad reputation for taking poultry is unfounded, based largely on rare instances and on the fact that the European polecat, from which it gets its name in some localities, is a serious poultry pest. These mammals decrease or disappear with the destruction of shallow-water vegetation and shore shrubbery.

Aquatic Plants

Aquatic plants are not without value. In aboriginal times a number of rushes of different sorts were used for making coarse mats and other suitable articles. In recent years the leaves of the narrow-leaved cat-tail have been employed in paper making and in cooperage.[29] Water plants, notably wild rice, supplied food to the American Indians. Flour of good quality has recently been made from the cat-tail.[30] Hedrick[31] has advocated multiplying the variety of crops. "In China and Japan the corms, or tubers, of a species of *Sagittaria* (arrowhead) are commonly sold for food. There are several American species which under the name arrowhead, swan potato, and swamp potato have given welcome sustenance to pioneers. Our native lotus, a species of *Nelumbo*, was much prized by the aborigines, seeds, roots, and stalks being eaten. *Sagittaria* and *Nelumbo* furnish starting points for valuable food plants for countless numbers of acres of water-covered marshes." Research on the cultivation of these should have been started long ago.

Special Localities

Semi-aquatic situations, such as water margins with their vegetation and swamps and marshes, constitute some of our most valuable and too-little-considered resources. They are linked with all truly aquatic resources in ways suggested above so as to be inseparable from them.

Water Margins

The statistics collected in Illinois show that two-thirds[32] of all the birds

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[27] D. E. Lantz: The Muskrat, *U. S. Dept. of Agric. Farmers' Bull. 396*, 1910.

[28] *Idem:* Economic Value of North American Skunks, *U. S. Dept. of Agric. Farmers' Bull. 587*, 1914.

[29] J. G. Needham and J. T. Lloyd: The Life of Inland Waters: An Elementary Text Book of Fresh-Water Biology for American Students, Ithaca, N. Y., 1916, p. 381.

[30] P. W. Claassen: A Possible New Source of Food Supply, *Scientific Monthly*, Vol. 9, 1919, pp. 179-185.

[31] U. P. Hedrick: Multiplicity of Crops as a Means of Increasing the Future Food Supply, *Science*, No. 1035, Vol. 40, 1914, pp. 611-620.

[32] Frank Smith: The Relation of Our Shrubs and Trees to Our Wild Birds, *Illinois Arbor and Bird Days Circular No. 83*, pp. 8-17, Supt. of Public Instruction, Springfield, Ill., 1915.

FIG. 1—A sluggish Indiana stream with its margin in a primeval state. Note four zones of vegetation—water lilies, low shrubs, high shrubs, and trees.

FIG. 2—A small Illinois stream with its margin in the original condition. Note a growth of shrubs with a few trees behind them.

FIG. 3—The same stream shown in Fig. 2, about a mile from the point there shown, on the farm of a different owner. A few trees are left, but all shrubs which make important bird-nesting sites have been destroyed by cutting or overgrazing.

which are valuable for eating insects and which, for the most part, are not included with the shore and aquatic birds, are in some way dependent upon shrubbery such as grows on the margins of watercourses (Figs. 1 and 2) and such as might be cultivated along roadsides.[33] The bobwhite, for example, breeds about thickets and is of especial value to the farmer. It has been predicted that in the Middle West, where farmers are inclined to clear away all the bushes (Fig. 3), many of the species dependent upon shrubbery will disappear. The tendency to destroy the thickets, especially on the stream margins, causes an obvious decrease of birds. A good skirting of trees along streams is also conducive to the presence of fish, because many food fishes prefer shade. Shade also greatly increases recreation value. As a rule, the lowest land along streams is not useful for anything but for growing trees and shrubs.

Swamps

Those who advocate swamp drainage appear to consider it as an unqualified good. On the other hand, some regard the drainage of certain swamps as an unmitigated evil. The preservation of the entire Everglades swamp region, for example, might seem absurd; but it is not so absurd as it appears if we give full consideration to the value of our North American birds.

Our Southern swamps lie in the direct migration route of many species of birds that are used as food or that destroy crop pests farther north.[34] This is so important that through gifts and state acquisition Louisiana has set aside areas of swampy land along the southern coast to serve as way stations for migrating birds and as breeding places for the native species. The marshes and watercourses of Louisiana yield upward of $700,000 a year in food, furs, etc. No swamp in the Gulf States or Georgia should be drained without full consideration of these losses. Experiment stations should be established, and at these stations studies should be conducted of the means of increasing the productivity of marshes.

Upland marshes also have values similar to those of the lowland marshes and coastal swamps, with an additional and important function. With the clearing off of timber and the draining of such swamps the streams are subject to greater floods and to extreme low water. At extreme low water a very small amount of pollution overtaxes the self-purification mechanisms, with results almost as disastrous to fishes and similar animals as if the low water occurred throughout the year.

There has been much discussion of the necessity of building dams from which water could be slowly released in dry seasons to maintain flow. Why then destroy the upland marshes which serve as reservoirs, or as great

[33] W. L. McAtee, work cited in footnote 1.

[34] M. L. Alexander: Conservation Laws of Louisiana..., State Conservation Commission, New Orleans, 1916.

sponges holding water and letting it out gradually? Needham and Lloyd[35] advocate lowering parts of these below permanent water level and putting the soil thus removed on equal areas. The dry land could be used for agriculture, and the ponds for water culture. Though the science of aquiculture is as yet in its infancy, it appears that fresh water may be made as productive as land.

A part of any large swamp such as the Okefinokee Swamp, or any other natural area, is as valuable as the most expensive American museum, one which requires say an endowment of $10,000,000 and an annual expense of $500,000. Such swamps are really museums of living things, the value of which at any time may become infinitely great in the solution of important scientific problems which involve living animals. Each year animals and plants find new uses and new values; a century ago no one would have thought white rats, guinea pigs, and common mice worth saving. If the question of sacrificing all these for a little additional land to cultivate had been raised it would have received but one answer. Yet by far the greater part of our laws of immunity from disease and of heredity—especially heredity of cancer—have been or are still being worked out on these animals. To quote a recent writer on water culture: "We urge that water areas, adequate to our future needs for study and experiment, be set apart and forever kept free from the depredations of the exploiter and of the engineer."

Brackish-water swamps serve as important breeding places for wild fowl. The low wet areas along the New Jersey coast have been notorious for the mosquito pest. The increase of mosquitoes in recent years has been attributed to the decrease of insect-eating shore birds and waterfowl. To perfect the control of the mosquitoes, systems of ditches have been provided by which small fishes, the killifishes, are enabled to get at and devour the larvae and pupae. During the war, in 1917-1918, the munition works discharged a mixture of sulphuric and nitric acids into these waters which repelled the killifishes and locally neutralized the effects of the ditching work.

Recreational Values

In addition to their value as producers of aquatic products used for food, buttons, clothing, etc., streams and bodies of water have a recreational value. The recreation values may be roughly divided into two classes, (a) sportsman's and (b) park. The value of the former may be ascertained by estimating the value of all clubhouses, cottages, boats, launches, etc., which are directly dependent upon the river or lake.[36] The value of these

[35] Work cited in footnote 29.

[36] G. E. McCurdy: Report of Survey and Proposed Improvement of the Fox River. State of Illinois Rivers and Lakes Commission. Chicago. [1915].

C. D. Hill: The Sewage Disposal Problem in Chicago. *Amer. Journ. of Public Health.* Boston. Vol. 8, 1918, pp. 833-837.

is the capitalization, on which interest may be computed. The interest, salaries of caretakers, and value to local merchants constitute the annual value. These activities tend to disappear from badly polluted streams. Park value is best ascertained from the statistics of cities.[37] The larger American cities (e. g. Chicago) spend annually from $2.00 to $4.00 per capita on parks (exclusive of lighting and including interest on investment) and outdoor swimming pools. Clean lakes and streams also have an esthetic value on which no price can easily be set. The question of whether or not streams shall receive untreated wastes beyond a very limited amount, and whether wastes shall be treated or not, is largely an ethical question and is best settled as such. The nation has preserved certain areas as national parks, national monuments, national forests, etc., for the use of the nation as a whole. The states have reserved some similar areas. The humblest citizen has a right to the recreation values of some of the bodies of water near his home, and his children should be able to wade in a near-by stream and pick up stones without danger to health. The day is past, even in America, when these general interests can be sacrificed for the profit of a small group of citizens.

Water Fertilization, Self-Purification, and Pollution

It is a fact that a certain amount of purely household sewage added to water increases nitrogen and hence acts as a fertilizer, producing more food for fish and other aquatic animals. Certain European towns run their sewage into ponds where the yield of carp is increased through the increase of fish food.

In America there is no such thing as purely household sewage; even in the smallest town the garage runs oil and gasoline into the sewers, the creamery adds milk wastes, or the gas plant adds quantities of deadly poison, until there is really no certainty that the process of breaking down the organic matter of the household sewage present into nitrogen available for fish food will go on. In addition, washings from roads surfaced with various tars and oils complicate matters and kill the fish.[38] This subject has received careful attention in England.

How much sewage can be used advantageously as fertilizer? The amount that can be used for carp is detrimental to most aquatic resources, because carp are more resistant than almost any American food fish. When is a stream self-purified? The sanitary chemist and bacteriologist have criteria, but they fail for important aquatic organisms. A large number of questions demand investigation. Tests of the toxicity of sewage and

[37] General Statistics of Cities: 1916. U. S. Bureau of the Census. Washington, D. C., 1917.

[38] W. J. A. Butterfield: Relation Between Modern Road Surfacings and Fish Life. Inst. of Municipal and County Engineers. London, 1912.

industrial wastes and other poisons introduced into the water must be made, as a basis for rendering them harmless.[39] The question, often asked, as to whether or not a given substance will injure fishes,[40] in general cannot be answered. First of all, the resistance of different species and of different stages of the same species, differs as much as fifty-fold for the same poison.

Conditions in streams and other bodies of water vary. The summer low-water conditions are dangerous because of little flow, of concentration of polluting substances, and of high temperature, which increases toxicity; the winter low-water conditions are dangerous because of slow flow and because of the presence of ice, which prevents aëration.

There are various methods, new and old, of treating sewage. It is true that European plants for the recovery of sewage materials by the older processes have failed to pay profits. It is possible that methods, old or new, pay only when the damages which result from pollution are taken into account. The damages must include a value on all resources represented by a stream or other body of water. Sewage contains much nitrogen needed to maintain soil fertility. It is recovered and put into form suitable to return to the land with doubtful success at the present time,[41] but that is largely because of the lack of adequate effort.

The pollution of the sea is quite extensive near our populous areas. The most widely known of its several effects is the contamination of shellfish beds and bathing beaches with typhoid. To prevent this Winslow and Mohlmann[42] have proposed the sterilization of the New Haven sewage, thus putting a value on sterile media for bathing beaches and oyster beds. The Miles acid, which they favor, gives an effluent less dangerous to fisheries than raw sewage, as a slight treatment by some aërating process removes the SO_2 used and leaves intact all the benefits from the standpoint of public health.

Danger to public health is recognized by the International Joint Commission,[43] who gave the opinion that no untreated sewage should be introduced into the boundary waters between the United States and Canada. Here stands the British Empire ready to defend its humblest citizen! The benefit of such a policy in our national waters would accrue to the health of the downstream neighbors of a community that treats its sewage.

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[39] V. E. Shelford: Work cited in footnote 10; *idem*: Second work cited in footnote 4.

M. M. Wells: The Reactions and Resistance of Fishes to Carbon Dioxide and Carbon Monoxide, *Bull. Illinois State Laboratory of Nat. Hist.*, Vol. 9, pp. 557-571, Urbana, 1918.

[40] E. B. Powers: The Goldfish as a Test Animal in the Study of Toxicity, *Illinois Biol. Monographs*, Vol. 4, pp. 127-193, Urbana, 1918.

[41] J. E. Porter: The Activated Sludge Process of Sewage Treatment: A Bibliography of the Subject, General Filtration Co., Rochester, N. Y., 1917.

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[42] C. E. A. Winslow and F. W. Mohlmann: Acid Treatment of Sewage, *Municipal Journ.* Vol. 45, 1918, pp. 280-282, 297-299, 321-322.

[43] G. W. Fuller: Biochemical and Engineering Aspects of Sanitary Water Supply, *Journ. Franklin Inst.*, Vol. 180, 1915, pp. 17-61 (espec. pp. 32-34).

Co-operative Research and Permanent Basis of Production

From lack of knowledge, or through carelessness, we have continually recurring destruction of various natural agencies that work in part toward the good of mankind. Study of these has been made, but our private organizations and our individual efforts are scattered. The work of our government bureaus has often fallen into ruts which have crushed out the individual initiative of the investigators. Often all effort has been directed toward the establishment of the pet hypotheses of those in charge. In our government organizations these investigating bureaus are usually separate, often competitive, usually not based on the logical requirements of the problems to be studied, and frequently guilty of undue generalization. Organization should be such that a complete force of investigators can be put to work on a problem. What should be done with this or that swamp? It is not a problem for engineers alone. First of all there should be a careful study of all its products—wood, lumber, fish, game, furs, etc., and their value. Foresters, zoölogists, ornithologists, chemists, engineers, and ecologists (who deal with the fine adjustments of organisms to one another and to conditions) should constitute a co-operative organization.

It is well to picture the items which enter into the draining or pollution of a shallow lake or bayou. Assume that the body of water lies in a populous region, contains 40 square miles of water and swamp, and is connected with a stream used for water power, for recreation, for waste dilution, and for navigation. On its shores is a small city of 10,000 inhabitants. What is its value in a primeval state?

ESTIMATED VALUE, BEFORE DRAINING, OF THE RESOURCES OF AN IMAGINARY LAKE NEAR A SMALL CITY

Food and Clothing		
Frogs and crayfishes shipped	$15,000	
Fishes and turtles shipped	12,200	
Fish caught by anglers	300	
Game birds shot	300	
Plant products	200	
Mammals—skins and food	500	
Value of shore birds to crops	30,000	
Total		$58,500
Recreation		
Park value to a town of 10,000 (based on expenditure of cities)	$30,000	
Sportsman's value (interest on $100,000 invested in boats and cottages)	5,000	
Net profits to community from recreation visitors	10,000	
Total		45,000
Water Conservation		
Water-storage value as insurance against floods and extreme low water, as a protection against loss to fisheries, water power, recreation, and navigation downstream	$30,000	30,000
		$133,500

A study of the literature of the subjects concerned, cited on the preceding pages, will show that the figures assigned are not unreasonable. Ought a community of 10,000 to destroy the food and recreation values ($103,500) of the lake to the extent of 40 to 80 per cent in order to save a $30,000 annual expense for treating sewage and industrial wastes? The answer is obviously No. Should three-fourths of the 40 square miles be converted into farms at an expense for ditching and diking of $1,000,000, including title, and the land sold at a profit of $1,000,000? The land might produce $500,000 worth of food each year, with the complete destruction of $133,000 value, leaving $367,000 to cover increased cost of labor in cultivation and interest on investment, but perhaps nothing more. However, the increase in food production is highly desirable. The dangers to the downstream inhabitants from floods and drought, which increase as population increases, constitute not merely a monetary loss, but the maintenance of stream flow is a moral obligation growing with the population.

Then why does such drainage take place? It is primarily because certain rights to land based on English common law have become established, and the interest of the owners lies in profits and dividends rather than in a consideration of the general good. The interest of sanitary engineers, users of water power, navigators, sportsmen, fishermen, in fact all concerned in maintaining a steady flowing stream (both floods and extreme low water are dangerous) points to the development of aquiculture in lakes and marshes connected with important streams. Before much progress can be made, both research and legislation are necessary. Our laws relative to riparian rights, like those of England which caused the destruction of the salmon in the Mersey, do not make possible the application of the best measures for the general good to marshes and streams and their margins. The laws should be improved, and campaigns of education should be inaugurated.

Above all, there is need of putting existing aquatic resources on a permanent basis. There has been too much fish "mining," mussel "mining," i. e. too much of the tendency to take all and go to the next place or the next product, and not enough "farming" of these resources. Why, with all our immense rivers, should we import mussels from China? Is it not better to work out a basis for a permanent supply from our own waters? Here research is necessary; as yet we know little or nothing about what portion of the individuals of any species can be safely removed each year and leave a permanent supply under the best conditions we can devise.

THE NIAGARA CUESTA FROM A NEW VIEWPOINT

By A. W. GRABAU

The generally accepted explanation of the origin of the Niagara Escarpment, or Cuesta, and that of the other cuestas which parallel it and which form such significant features in the physiographic history of the eastern United States, is by now familiar to all students of earth forms and their genesis. Outlined originally, in its fundamental features, by William Morris Davis, it has always formed one of the most satisfying examples of land forms produced by the activities of the agents of erosion in a region of simple structure and normal alternation of resistant and weak strata. This conception of the origin of these escarpments has thrown a flood of light upon the early history of the valleys now occupied by the Great Lakes and has furnished a key to the rational analysis of the rather complicated arrangement of many of our old and partially abandoned stream valleys, not only in New York state but also in the adjoining districts. As in the case of all great generalizations, however, prolonged study and discussion of the problems involved has led to amplification and, to a certain extent, modification of the original conception, and in this Davis himself has taken a leading part. As one who for more than two decades has been actively interested in the physiographic history of eastern North America and especially of the Great Lakes district, I am now impelled to summarize some of the results of my studies which involve a further modification of the interpretation of these escarpments and of the valleys paralleling and transecting them. If this shall result in removing these land forms from the category of the simple belted structure of an ancient coastal plain and make them the type of a geographic structure not heretofore so generally recognized, it can but serve the progress of knowledge.

The Two Older Conceptions of the Origin of the Cuesta and Lowland Topography of Western New York

The original conception of the history of the strata which form the series of east-and-west ridges and lowlands so well displayed in New York state south of Lake Ontario can be gleaned from a perusal of our older textbooks of geology.[1] These strata were held to have been deposited in a sea progressively retreating southward, and the present northern edge of each formation was held to coincide approximately with the northern shore line of the sea in which each was deposited. Davis taught us to realize that the present limits of these strata were primarily produced by prolonged erosion

[1] See, for example, Joseph Le Conte's "Elements of Geology," 4th edit., New York, 1896, p. 309.

and that most, if not all, of the formations involved formerly extended much farther to the north—indeed, that they probably overlapped one another so that the northern portion of each came in turn to rest upon the crystalline rocks which formed the Canadian Oldland, against which these formations were deposited as coastal plain strata in the Paleozoic sea. The two contrasting conceptions just outlined are illustrated in the following diagrams, the first of which indicates the deposits formed in a retreating, the second in an advancing sea, the successive sea levels being indicated in numerical order (Figs. 1 and 2).

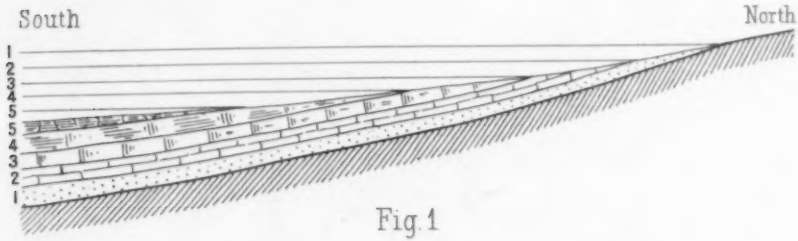

Fig. 1

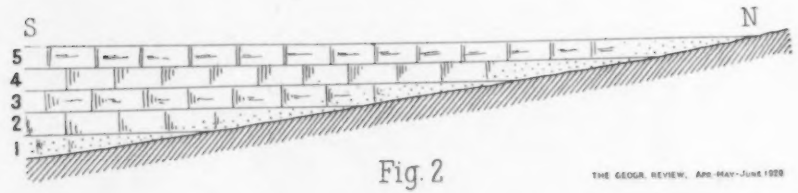

Fig. 2

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FIG. 1—Diagram showing the older conception of the order of deposition of the Paleozoic formations in eastern North America. The seashore is regarded as progressively retreating, each later formation being deposited over a smaller area than the preceding. Order of deposition: 1 to 5.

FIG. 2—A newer conception of the mode of deposition of the formations, each younger one overlapping the preceding.

The second interpretation does not necessarily imply such regularity of advance as is suggested by the diagram, for this is intended primarily to illustrate the general conception of a coastal plain series formed in a sea which on the whole was advancing over the oldland, and takes no account of minor irregularities of advance or of intermediate periods of partial retreat, followed by readvance.

From such a relatively simple coastal plain series, fringing an oldland which in part at least supplied the material of the coastal plain deposits, the peculiar cuesta and lowland topography so characteristic of this region was carved upon elevation, by the development of a normal sequential drainage system. The streams of the oldland became extended across the coastal plain and formed the original consequent rivers which began to cut down through the strata approximately at right angles to the original shore lines. The development of subsequent streams, more or less at right angles

to the consequents, began to strip away the portion of the coastal plain which rested against the oldland and so formed the first inner lowland belt. If the surface layer was a stratum of hard rock overlying one of softer material, a cliff was formed which faced this lowland and was separated by it from the oldland on the north. This cliff constituted the "inface" of the first cuesta, which was made up of the remnant of the coastal plain left after the formation of the first inner lowland (Fig. 3). As the inface of the cuesta retreated under the influence of continued erosion the inner lowland was widened, and as the consequent streams continued to deepen their valleys the subsequent streams were likewise enabled to deepen the inner lowland. If a second hard stratum was discovered beneath the soft one on which the inner lowland was carved, a new cliff or inface came into

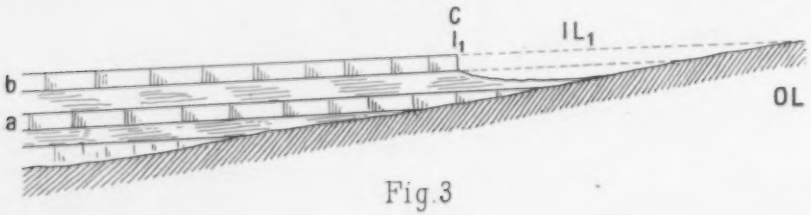

Fig. 3

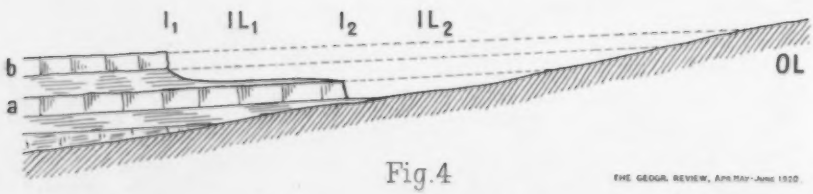

Fig. 4

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FIG. 3—Diagram showing early stage of dissection of the coastal plain, with the formation of an inner lowland (IL_1) which separates the inface (I_1) of the first cuesta (C) from the oldland (OL). a,b—hard strata.

FIG. 4—A later stage of dissection of the same coastal plain series. The second hard stratum (a) has been uncovered by the downward cutting of the streams, and a new inface (I_2) has been formed on it, with a new inner lowland (IL_2) between it and the oldland (OL). The first cuesta has been reduced by the seaward pushing, through continued erosion of the inface, and the migration of the first inner lowland (IL_1) in the same direction. As here shown, the two lowlands and cuestas are better regarded as a single terraced cuesta, comparable to the Niagara Cuesta, the lower part of which, seven miles north of the upper, is submerged by the waters of Lake Ontario. If the upper inface (I_1) were pushed by erosion far enough away from the oldland, the outer lowland (IL_1) would come to lie at the level of the inner one (IL_2) because of the dip of the strata.

existence as this second stratum was cut through to another softer one beneath it. Thus a double or twofold cuesta was formed, with two inner lowlands parallel to each other. These two stages are illustrated in the accompanying diagrams (Figs. 3 and 4).

A Modification of the Original Conception

Another modification of this conception, which was held for a time, was in reality a combination of the two explanations of origin primarily given.

This was as follows: After the deposition of the first pair of soft and hard strata, the sea retreated, uncovering a part of the coastal plain, and upon this exposed portion was cut the first lowland faced by the escarpment or inface of the first cuesta. Meanwhile a second series of strata was forming in the still submerged portion of the coast, in part from the material eroded in the making of the first lowland and consequent valleys. When this second coastal plain series emerged, the process was repeated and the second lowland was cut, the second cuesta thus coming into existence. The adjoin-

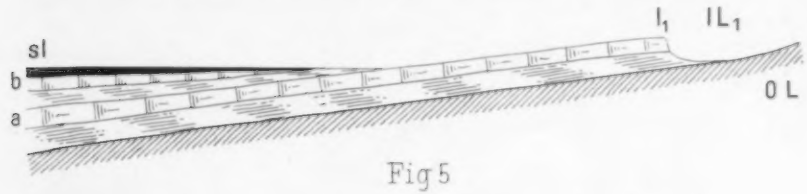

Fig 5

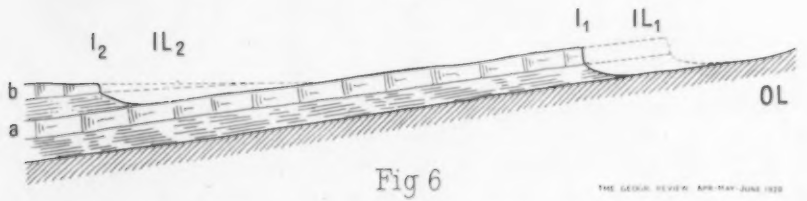

Fig 6

FIG. 5—Diagram illustrating the conception of the cutting of a cuesta topography and inner lowland on the first set of strata and the simultaneous deposition of a second set of coastal plain strata in the sea. The sea is represented by solid black. a,b—hard strata; I_1—first inface; IL_1—first inner lowland; OL—oldland; sl—sea level.

FIG. 6—A later stage of the series illustrated in Fig. 5. The second coastal plain series has emerged, and a new inface has been cut on the upper stratum b, while the inface of the lower stratum has been worn farther back.
a,b, I_1, and IL_1 as in Fig. 5. I_2—second inface; IL_2—second inner lowland.

ing diagrams (Figs. 5 and 6) illustrate this conception of the course of events. It will be seen that the first inface is cut on the lower stratum (a) and the second on the higher one (b), whereas in the conception illustrated in Figures 3 and 4 the reverse is the case.

THE CUESTAS OF THE EASTERN GREAT LAKES REGION

So far, we have outlined the general theories of the development of coastal plain topography which were applied practically without modification to the ancient coastal plain of New York and adjoining regions as well as to the ancient coastal plain of central England and other districts. A number of cuestas and lowlands have been recognized in the New York region, the first cuesta of any significance, the northern, being that formed on the Ordovician limestones in Canada north of Lake Ontario. The second pronounced cuesta was formed by the Silurian limestones and constitutes

the well-known Niagara Escarpment south of Lake Ontario, this lake occupying the overdeepened second inner lowland. The third cuesta was formed by the Middle Devonian (Onondaga) limestone of western New York, which faces the Salina, or Tonawanda Valley, lowland, one of the prominent east-and-west valleys or lowlands of New York state. Still farther south lies

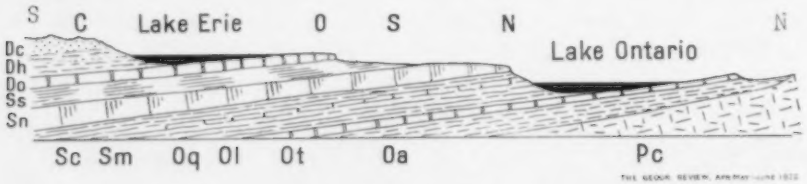

FIG. 7—Diagram illustrating the several cuestas and lowlands of western New York and Ontario and the strata from which they were cut.

N=Niagara Cuesta; S=Salina Lowland; O=Onondaga Cuesta; C=Chemung Cuesta. Pc=Pre-Cambrian; Oa=Lower Ordovician shales and limestones; Ot=Trenton limestone; Ol=Lorraine shale, etc.; Oq=Queenston red shale; Sm=Medina shales and sandstones; Sc=Clinton formation; Sn=Niagaran formation (Rochester shale and Lockport limestone); Ss=Salina shales; Do=Onondaga limestone; Dh=Hamilton shales, etc.; Dc=Chemung shales and sandstones. Preceding a small letter, O indicates Ordovician; S, Silurian; D, Devonian.

the fourth cuesta inface formed by the Upper Devonian (Portage and Chemung) sandstones, between which and the Onondaga Cuesta lies the lowland carved on the soft Middle Devonian (Marcellus and Hamilton) shales, the western part of this lowland being occupied by the eastern end of Lake Erie (Fig. 7). Owing to tilting after their formation the southern cuesta

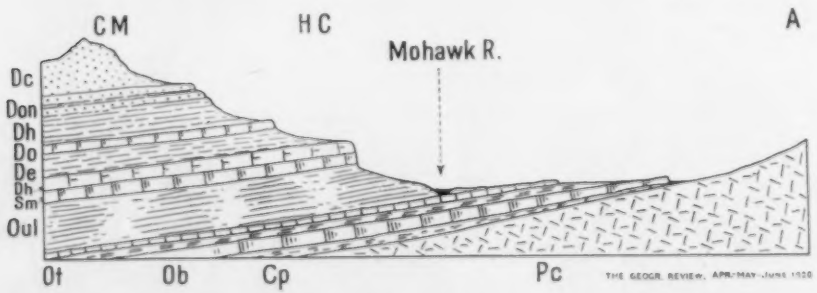

FIG. 8—Diagram illustrating the relation of the various strata to the single inner lowland (Mohawk Valley) and the terraced cuesta of the Helderbergs in eastern New York.

A=Adirondacks; HC=Helderberg Cuesta (terraced); CM=Catskill Mountains (monadnock). Pc=Pre-Cambrian crystallines; Cp, Potsdam sandstone; Ot-Ob=Ordovician limestone; Oul=Ordovician shales; Sm=Manlius limestone (Silurian); Dh=Helderberg limestone (Devonian); De=Esopus shale (Devonian); Do=Onondaga limestone; Dh-Don=Devonian shales and sandstones; Dc=Catskill sandstone.

is now much higher than those farther north. Eastward the Upper and Middle Devonian cuestas unite by the change of the Middle Devonian soft beds to harder strata, and so is formed the Helderberg Escarpment south of Altamont, which is further increased in height by the appearance of the

Lower Devonian (Helderberg) limestones beneath the Onondaga. The Salina and Niagara strata die out, and with them disappear the respective lowland and cuesta. The Lake Ontario lowland is continued in the

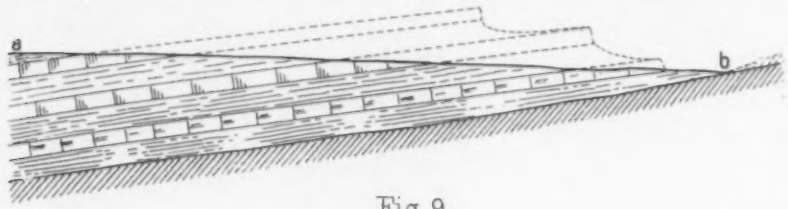

Fig 9

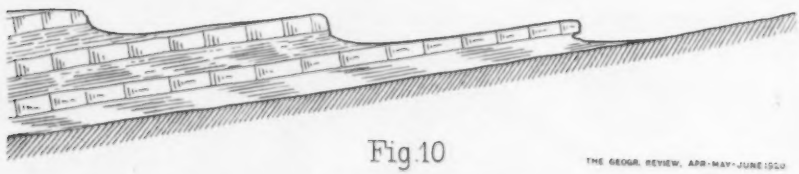

Fig.10

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FIG. 9—Diagram illustrating beveling of the old Paleozoic coastal plain strata along the line ab by peneplanation in Mesozoic time.

FIG. 10—Diagram illustrating the formation of cuestas and lowlands on the hard and soft strata respectively by the Tertiary erosion.

Mohawk Valley, which thus lies at the foot of the combined Devonian cuestas on which the lower hard members form terraces. Thus in eastern New York there is only one lowland and one cuesta, which, however, is terraced. This is illustrated in Figure 8.

LATER MODIFICATION IN INTERPRETATION OF PHYSIOGRAPHIC HISTORY OF REGION BROUGHT ABOUT BY RECOGNITION OF PENEPLANATION

We come now to the later modification in the interpretation of the his-

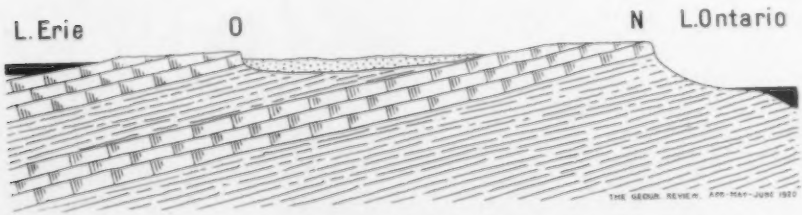

FIG. 11—Diagram showing the thinning of the hard beds on the Niagara (N) and Onondaga (O) cuesta edges, due to beveling of the hard strata during the peneplanation of the region.

tory of these topographic features and the change of opinion which came about by the recognition of the peneplanation of the region before the

development of the present river valleys and lowlands. Instead of considering that the region illustrates a succession of coastal plains on which the belted topography was developed or a succession of cuestas and lowlands developed as the result of the progressive uncovering of successively lower hard members in a single coastal plain, we now recognize that the present topography does not represent the first cycle of erosion but the last of an unknown number of cycles. We now recognize that all these strata were beveled across by the development of the Cretaceous peneplain, and that the successive lowlands were carved on the softer strata by the rivers of Tertiary time. This is illustrated in diagrammatic form in Figures 9 and 10.

This explanation involves only a minimum amount of retreat of the escarpments or infaces of the cuestas, which are on the whole very near the northern edge of the outcrops of the strata at the time of the completion of the peneplain. This is shown by the facts that only the lower parts of

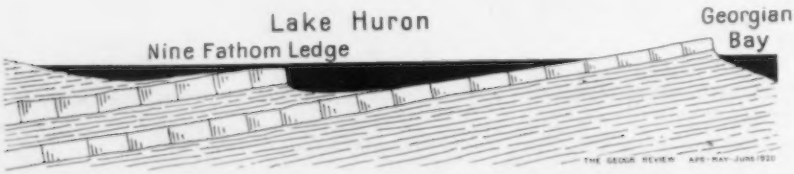

FIG. 12—Section through Lake Huron, from Saginaw, Mich., to Georgian Bay, showing the submerged (Onondaga) escarpment at Nine Fathom Ledge and the prominent Niagara Escarpment which faces Georgian Bay.

the hard formations are involved in the cliffs or infaces of the cuestas, the hard beds themselves having been beveled across. Thus in the Niagara Escarpment only the lower 25 feet of the Niagaran (Lockport) limestone is shown, the total thickness of which south of the falls is nearly 200 feet. At North Buffalo, where the Onondaga Escarpment is partly obscured by drift, only 30 or 40 feet of this formation remains, this being the lower part of the limestone which south of Buffalo retains its full thickness of over 150 feet. These features are graphically shown in Figure 11.

Though of little topographic significance at Buffalo, on account of obscuration by glacial drift, the Onondaga Escarpment becomes a prominent feature where it crosses diagonally through Lake Huron from north of Goderich, Ont., to Mackinac (for locations see map, Fig. 17), having a height of over 400 feet, although it is entirely submerged by the lake waters, as shown in the diagrammatic section (Fig. 12).

THE WRITER'S SUGGESTED MODIFICATIONS OF PRESENT VEIWPOINT

Thus far I have presented the views of the origin and relations of these

cuestas and lowlands generally held with more or less modification at the present time, and I now wish to present the modifications which further study of the problem seems to me to demand.

Derivation of Ancient Coastal Plain Material from Appalachia and Not from the Canadian Oldland

In the first place, our conception of the formations involved, as representing coastal plain strata deposited against and over the Canadian Oldland, requires to be revised. By definition the strata of a coastal plain are deposited upon and against an older, partly submerged land mass, the emerged part of which constitutes the "oldland" at the time of the deposition of the coastal plain strata beneath the sea or at its margin. Subsequent elevation brings a part of the coastal plain strata above the level of the sea, and this constitutes the coastal plain.

A critical examination of the Paleozoic strata of eastern North America leads to the conclusion that the oldland from which the fragmental material of these strata was derived was not the Canadian mass but a now vanished continent (Appalachia) which lay in the region of, and to the east of, the present Atlantic coast, a fact long known to geologists and physiographers. The strata involved in the folds of the Appalachian Mountains represent the nearshore ends of the formations which are now exposed in the edges of the escarpments in the belted country of New York, Michigan, and Wisconsin. The Canadian region lay a thousand miles or more from this shore, and there is now abundant evidence to show that, during a part of the time at least, it was completely submerged, forming a distant though comparatively shallow sea bottom. That the Ordovician, Silurian, and part of the Devonian beds extended entirely across the present crystalline surface of Ontario not only is shown by the presence of remnants of some of these strata upon this surface (as at Lake Temiscaming) and by the presence of most of them in the region to the north of the crystalline area in James Bay but also is a necessary inference demanded by the character of the strata and their faunas. I believe it is a sound conclusion generally held by paleogeographers that such formations as the Niagaran, for example, extended entirely across Ontario from the present Niagara Escarpment to the James Bay region and beyond to the Arctic. Here was for the most part a broad though shallow sea in Silurian time in which the coral reefs of that period were building, and, though here and there may have been islands of older rock and even peninsular extension of some land masses, yet on the whole this was a region of open sea, for here the limestones had their maximum thickness and their greatest purity. The fragmental beds which are still recognizable in New York as shales and sandstones have mostly thinned away in this more distant region by merging into the limestones.

The Ontario Dome Part of the Up-Domed Sea Bottom and Not the Paleozoic Oldland

At a subsequent period in the history of the region, the Ontario area was elevated into a low dome, one of the numerous domes formed at the end of Paleozoic time in eastern North America. During the Mesozoic era this dome was peneplained, with the result that all the covering strata were removed from the center of the dome, exposing the old crystallines, which during much of Paleozoic time formed a deeply buried sea floor. These crystallines are therefore a part of the up-domed sea bottom and not the oldland of Paleozoic time, and the Paleozoic strata on its flanks are merely the edges of beds which once extended entirely across them. On these rimming remnants of sea-bottom deposits the present cuesta and lowland topography was carved, much as the rimming series of hogbacks and concentric lowlands were carved on the edges of the strata exposed after the

Fig.13

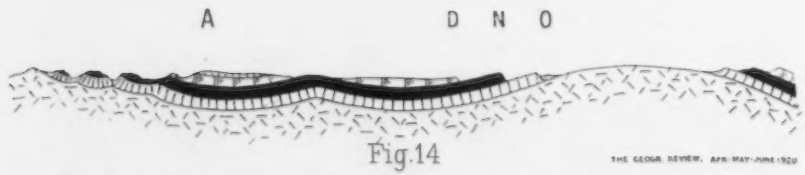

Fig.14

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Fig. 13—Diagram illustrating the folded Appalachian strata in the coastal plain region and the basining and doming in the region away from the shore.

A—Appalachian folds and Oldland; P—Pennsylvania Basin; N—New York Basin; O—Ontario Dome. The Ordovician, Silurian (black), and Devonian formations are shown. The Carboniferous is indicated by dotted lines. The Appalachian folds probably did not appear as such on the surface.

Fig. 14—Generalized diagram illustrating the formation of the cuesta and lowland topography on the borders of the Ontario Dome.

O—Ordovician cuestas; N—Niagara (Silurian) Cuesta; D—Devonian cuestas; A—Alleghany Plateau.

erosion of the Black Hills dome, only that there the strata are more steeply inclined. The accompanying diagrams, Figures 13 and 14, illustrate these features.

Radial Arrangement of Drainage as Evidence of Uplift of Ontario Dome in Tertiary Time

A further fact must, however, be noted. There is evidence that this

Ontario Dome suffered a renewed though slight elevation in early Tertiary time, for the consequent rivers which initiated the new drainage system had a roughly radial arrangement. This is excellently shown in the arrangement of the Finger Lake valleys of New York, an arrangement frequently noted and commented upon. For it is now recognized that these valleys were originally formed by consequent streams flowing from the north, though nearly all of them have subsequently been deepened by glacial erosion. A glance at the map (Fig. 15) shows this radial arrangement at once, and further comment is unnecessary. There are, however, a number of buried valleys which are not so easily recognized in the present topography but which readily take their place in the radial series of these consequent streams, which flowed from the rejuvenated Ontario Dome. The broad valley now occupied by the Genesee River from Rochester south to Mt. Morris is one of these. This continues as a pronounced open valley southward to Dansville, beyond which it can be followed without difficulty, though somewhat obscured by drift, to the Susquehanna drainage system. This valley has been greatly deepened by glacial erosion as far as Dansville, but south of that it retains its preglacial character except for a moderate amount of drift filling. A second parallel valley, lying farther to the west, is occupied by the modern Genesee from Portage southward, and the northward extension of this valley can likewise be traced with considerable accuracy. An even larger valley, which appears to have been cut by the main consequent stream from the Ontario Dome, is that of the ancient Dundas River (map, Fig. 16), which ran southwestward through the western end of Lake Ontario and was a member of the Mississippi drainage system. The valley of this stream is largely obscured by drift, but where it cuts the Niagara Cuesta, near Hamilton, Ontario, its width is nearly three miles. Finally, there is sufficient indication that a large river, flowing more nearly westward from the old Ontario Dome, cut the broad and deep notch through the Niagara Cuesta which now connects Georgian Bay and Lake Huron. This river was apparently responsible for the formation of the valley of Saginaw Bay, and it has been traced through borings at least as far as central Michigan.

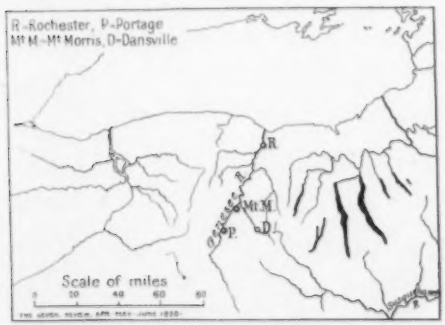

FIG. 15—Map showing (in solid black) the arrangement of the Finger Lake valleys in New York state.

We thus clearly perceive the radial arrangement of the Tertiary stream

valleys around a part of the old Ontario Dome, from the southeastern slope, where the valleys have a distinct southeasterly direction, to the western side, where the ancient valleys, now largely obscured by drift or submerged beneath the lake waters, have a marked westward trend. The tracing of other valleys farther east on the Ontario Dome is rendered difficult by the fact that here a second dome, the Adirondack, with its own drainage system, existed. Southwest of the Ontario Dome lies the Michigan Basin, and northwest of that the Wisconsin Dome. Thus in this region, too, the drainage was complicated by other drainage systems. The old drainage valleys on the north of the Ontario Dome have not been located, but when this region is more fully explored their existence will doubtless be shown.

The general character and direction of the Tertiary valleys on the known southern and western sides of the Ontario Dome are, however, quite sufficient to establish the fact that the Tertiary drainage system of this region was a radial one, and this can in my view be explained only on the basis of a renewed, though relatively slight, uplift of the Ontario Dome in Tertiary time. With the entrenchment of these radial consequents beneath the surface of the old peneplain, the possibility for the formation of rimming lowlands on the softer strata was developed, and in this process of lowland cutting the escarpment or cuesta infaces came into existence on the harder strata.

Development of the Drainage System in the Eastern Great Lakes Region in Tertiary Time

The most pronounced of the inner lowlands thus formed is the one now occupied by Lake Ontario. This valley was continued northwestward in the valley partly filled by the waters of Georgian Bay. The former connection between these two valleys is now filled by drift deposits, but a sufficient number of borings is known to prove such a connection. The valley of Georgian Bay was originally cut by streams tributary to the Saginaw River, and on the same soft Ordovician shales on which the Ontario Valley was carved by streams tributary to the Dundas River. The floor of the Georgian Bay Valley is, however, about two hundred feet lower than the lowest point in the now submerged floor of the gap which the Saginaw River cut through the Niagara Cuesta, and this indicates that at a later stage in the development of these river systems the headwaters of the Saginaw were captured by a branch of a more powerful stream working on the soft strata. This master stream was the Dundas River, the northwestern tributary of which, working along the base of the Niagara Cuesta in Canada, finally diverted the upper portion of the Saginaw drainage system into that of the Dundas. An eastern arm of this same master stream successively captured the headwaters of the southward- and southeastward-draining consequent from the Ontario Dome and thereafter deepened its valley to such an extent on the soft shales that the floor of this subsequent valley now lies in places nearly

a thousand feet lower than that of the beheaded consequents whose valleys we now trace in the Finger Lakes and in the several valleys of the Genesee country. Thus was developed the deep and broad valley of Lake Ontario, the rivers of which became tributary to the ancient Dundas drainage system, while the beheaded stream valleys of the other consequents—the Finger

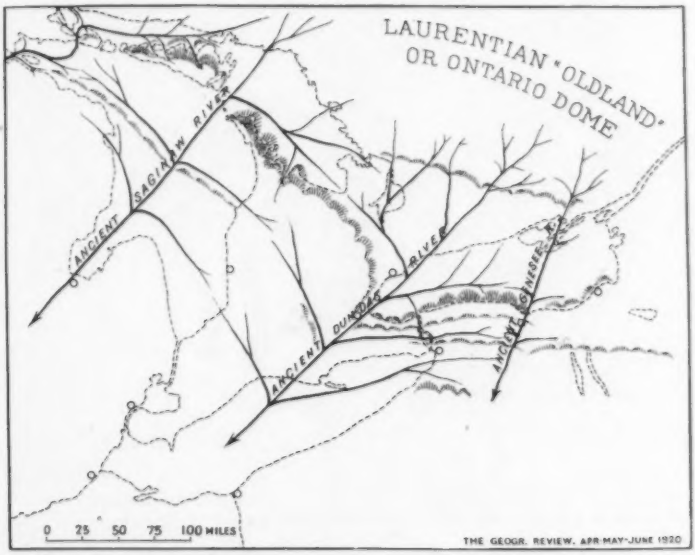

FIG. 16—Generalized map showing restoration of the drainage systems existing in early Tertiary time in the Ontario Dome region with their radial arrangement. (After Fig. 5, "Guide to the Geology and Paleontology of Niagara Falls and Vicinity," by A. W. Grabau, *New York State Museum Bull. No. 45*, Albany, 1901.)

Lake series—now end in the air at the edge of the Niagara Escarpment. In the accompanying two maps (Figs. 16 and 17) these steps in the development of the drainage system are shown.

FINAL STAGE IN THE DEVELOPMENT OF THE MODERN DRAINAGE SYSTEM

The final stage in the development of the modern drainage system was inaugurated by the overdeepening of most of the north-south valleys by the ice during the succeeding glacial periods and was completed by the deposition of heavy moraines within these old valleys, for the most part to the south of the overdeepened portion. The ancient outlet of the Ontario drainage system, the Dundas Valley, was completely blocked by drift, as were also portions of the Ontario-Georgian Bay lowland in the region flanking the Dundas Valley. Finally, the fact, apparent on the disappearance of the ice, that the entire region surrounding the Ontario as well as the Adirondack Dome had been depressed to a considerable amount during the occu-

pancy of this region by the ice induced a reversal in direction of the streams which reoccupied the old valleys, and thus the entirely abnormal St. Law-

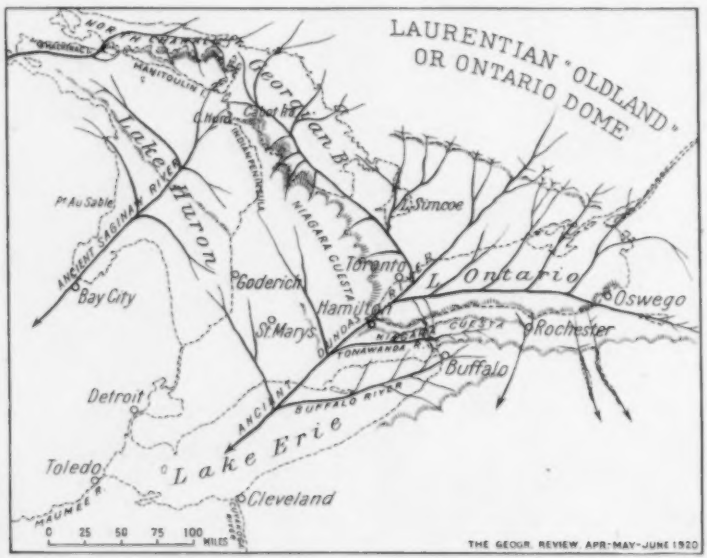

FIG. 17—Generalized map showing a probable later stage of the Tertiary rivers of the Ontario Dome with their capture and adjustment to the strata as suggested by the existing relief features. (After Fig. 6, *New York State Museum Bull. No. 45.*)

rence drainage system came into existence. If the Ontario and Adirondack Domes region were raised a thousand feet or more and if the obstructing drift were removed from the old valleys, the original southward drainage would become re-established. Along the lines of many of these ancient consequent streams, however, lakes would be formed, these occupying the overdeepened portions of the valleys, such as those of the Finger Lake valleys of New York. The St. Lawrence would again head in the Thousand Islands region, where would also originate a southwestward-flowing stream, tributary to the Ontario and Dundas Rivers. The Mohawk divide at Little Falls would become re-established, the western stream from this divide joining the Ontario River, while the eastern stream would continue to the Hudson as does the Mohawk today. This shortened Mohawk and the revived stream from the Lake Champlain region would re-establish the subsequent drainage system which was formed around the southern and eastern margins of the Adirondack Dome in Tertiary time. In relation to this system the Hudson has at least a partial consequent habit.

THE PRE-WAR COMMERCE AND THE COMMERCIAL APPROACHES OF THE BALKAN PENINSULA*

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The purpose of this paper is to present, with some approach to accuracy, the general characteristics of the commerce of the Balkan Peninsula. The student of the problems of the separate states finds himself, inevitably, drawing comparisons between them and seeking a broader basis for his study than the conditions of a single country afford him. He recognizes a general problem underlying the varied national questions. He demands a survey of the whole. The demand is reasonable and should be given more consideration than it has yet received, although, as will appear, it can be satisfied only in part.

The Field Covered in This Survey

The investigator who seeks to treat the commerce of the Balkan Peninsula as a whole finds serious gaps in the commercial statistics on which his work must be based. The figures of Turkish commerce were thoroughly unreliable before 1910, when a new system of determining values and quantities by declaration went into effect.[1] Even after that date the figures are given in such a form as to render difficult the distinction of European and Asiatic total trade and to make impracticable the distinction of individual items in the European trade. The total imports of Turkey in Europe in 1910 exceeded those of any other country in the peninsula and made up about one-third of the total imports of all Balkan countries; the exports were much less important, composing less than one-fifth of the total.[2] Unfortunately the form in which the Turkish figures are supplied

* Read at the joint meeting of the Association of American Geographers and the American Geographical Society at New York, April 16-17, 1920.

[1] An account of the change is given in British *Diplomatic and Consular Repts., Ann. Ser. No. 4885 [Cd. 6005-8]* and *No. 5045 [Cd. 6665-3]*. Figures of Turkish trade cited in the text are taken from "Turkey: Report for the Year 1912 on the Trade of the Consular District of Constantinople." *Diplomatic and Consular Repts., Ann. Ser. No. 5045 [Cd. 6665-3]*. London, 1913.

[2] The trade of European Turkey in 1910, from the figures of the British report reduced to round millions of francs, was as follows:

	IMPORTS	EXPORTS
Adriatic ports	21	13
Saloniki	103	24
Kavala, Üsküb, etc.	22	14
Dedeagach	14	6
Adrianople, Porto Lagos, etc.	20	9
Constantinople, Stambul, Galata	306	50
Total	486	116

To this should be added an estimate of the trade of the European ports of the Sea of Marmara and, a much more important item, trade subject to the Public Debt Administration and to the Imperial Tobacco Régie. Exports under this last head amounted, for the whole empire, to about 75,000,000 francs.

makes it impossible to include them in the detailed analysis on which this paper is based.

The northwestern part of the peninsula must also be omitted from the survey. Material exists on which rough estimates of the trade of Dalmatia could be framed, and relatively good commercial statistics are supplied for Bosnia and Hercegovina,[3] but it does not appear profitable to attempt to include either these districts or the independent state of Montenegro, whose commerce is relatively insignificant, in the comparison.

Method Employed in Compilation of Statistics

The conclusions of this paper, therefore, are based on the commercial statistics of four countries of the Balkans: Rumania, Bulgaria, Serbia, and Greece. These statistics, compiled in a form suited to a summary survey, are presented in Tables I-VIII. They relate to the years 1910 and 1911, giving an average of the two years. The period covered seems now far distant, but is actually the most recent period in which peace prevailed and in which normal commercial relations can be studied.

It is difficult to group together, for the purpose of a survey, the commercial statistics of the four separate countries, and I have simplified the process, at the expense of ideal accuracy, by treating only the principal items of import and export. Differences of classification and of nomenclature in the statistics of the separate countries, together with the overwhelming detail of the primary statistical sources, make it impracticable for the private investigator to fuse all the different figures into one mass and then recast the unified statistics according to the plan which appears to him to bring out best their significance. I have chosen five groups—agricultural products, animal products, forest products, minerals, and manufactures—and have classified the principal items under those heads. The sum of these items amounts to about 70 per cent of the value of the total imports and approaches 90 per cent of the value of the total exports. The remaining items are great in number but of little importance taken separately; these items are not distinguished in my analysis.

In the years named the total trade, combining imports and exports, of the four leading countries was valued at about 2,000,000,000 francs a year, considerably less than one per cent of the total trade of the world. These

[3] These are published by the Landesregierung, Sarayevo, and, after the delay of some years, are summarized in *Oesterreichische Statistik*. Fortunately an article by Dr. A. Korompay, published in the Austrian *Statistische Monatschrift*, Vol. 40, 1914, Vienna, just before the outbreak of the war, gives figures for 1910 and 1911. The significant figures for Bosnia and Hercegovina in 1910 are as follows, in millions of Austrian crowns (roughly equivalent to francs):

	IMPORTS	EXPORTS
Raw and semi-manufactured materials,		
for use in industry	3	39
for consumption	29	51
Manufactured wares	113	43
Total	145	133

four countries together outranked in commercial importance Portugal or Finland or Norway but counted for less in world trade than Sweden or Spain or even the little country of Denmark.[4] If the figures for Rumania be excluded, on the ground that that country belongs rather to the Continent than to the Peninsula, the total commerce of the Peninsula would be cut in half.

Character of Exports

Considering first the exports of the four Balkan countries named above, the striking feature is the immense preponderance of agriculture over other branches of production (Table II). Agricultural products composed three-fourths of the value of the whole. Animals and animal products (eggs, hides, meat, etc.) when added bring the aggregate farm products, as they may be called, up to four-fifths of the total value of the exports. The products of the forest, the mine, and the factory would at most, therefore, compose one-fifth of the total exports but in fact were probably not much more than half of that. The lumber and the petroleum of Rumania and the mineral ores of Greece are practically the only items in the list worth separate enumeration. I have purposely framed the list so as to include under agriculture those products, like flour and olive oil, which are often classed as manufactures but which seem to me misplaced and misleading when put under that head. Actually the perfume industry of Bulgaria, with its product of attar of roses, appears in my tables as the only export industry of any account under the head of manufactures, contributing six-tenths of one per cent to the total value of the Balkan exports in 1910-1911; a critic might well urge that that industry also, by reason of the primitive character of the equipment and processes employed, ought not to be counted as a manufacture in the usual modern sense.[5]

Character of Imports

The reverse of this picture is presented by the table of imports into the Balkan countries (Table IV). Less than one-tenth of the total is composed of those agricultural products sufficiently important to be separately enumerated. The larger part of this sum is composed of the one item of grain imported into Greece, which alone among the Balkan countries has a serious deficiency of this necessary foodstuff. Other items are scattering and relatively unimportant: coffee, sugar, olives, and olive oil.

[4] See comparative figures in marks in *Statistisches Jahrbuch für das Deutsche Reich*, Vol. 35, 1914, Berlin, Appendix, Table 38.

[5] A classification different from that employed in the British compilations on which my tables are based would bring other manufactured items into the list of exports. Bulgaria, for example, shows an export of "textile materials and products" somewhat larger in value than the export of perfumery. That part of the export, however, which represents a finished manufacture is made up of coarse woolens such as *chayak* and *abas*, domestic products exported mainly to Turkey; the item of finished cloths is inconsiderable. Cf. *Annuaire Statistique du Royaume de Bulgarie 1910*, Sofia, 1911, pp. 297, 325, 331.

Two points stand out when the agricultural imports of the Balkan countries are analyzed. The first is the non-appearance of raw materials for manufacturing industry. Raw cotton, for example, appears in the list, but as an insignificant item, contributing only about one-third of one per cent of the total value of the imports. The second is the small purchase which

TABLE I.—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): EXPORTS *
(Values in thousands of francs)

	Rumania		Bulgaria		Serbia		Greece		All	
AGRICULTURAL PRODUCTS	540,220	.....	104,647	.....	51,058	.....	96,307	.....	792,232	.....
Food										
Grain	.....	522,785	.....	97,736	.....	35,254	.....	.....	.....	655,775
Fruits	.....	.....	.....	.....	.....	15,804	.....	48,982	.....	64,786
Haricots	.....	14,124	.....	4,948	.....	.....	.....	.....	.....	19,072
Tobacco	.....	.....	.....	.....	.....	.....	.....	14,880	.....	14,880
Wine	.....	.....	.....	.....	.....	.....	.....	14,588	.....	14,588
Cognac	.....	.....	.....	.....	.....	.....	.....	2,362	.....	2,362
Olive oil, olives	.....	.....	.....	.....	.....	.....	.....	15,495	.....	15,495
Peas	.....	2,185	.....	.....	.....	.....	.....	.....	.....	2,185
Sugar	.....	1,126	.....	.....	.....	.....	.....	.....	.....	1,126
Colza	.....	.....	.....	1,963	.....	.....	.....	.....	.....	1,963
Raw Material										
ANIMAL PRODUCTS	14,863	.....	24,708	.....	21,689	.....	3,241	.....	64,510	.....
Food										
Animals	.....	5,708	.....	6,206	.....	8,912	.....	.....	.....	20,826
Eggs	.....	3,870	.....	11,241	.....	.....	.....	.....	.....	15,111
Meat	.....	.....	.....	.....	.....	9,194	.....	.....	.....	9,194
Fish	.....	1,329	.....	.....	.....	.....	.....	.....	.....	1,329
Cheese	.....	.....	.....	3,854	.....	.....	.....	.....	.....	3,854
Raw Material										
Hides	.....	2,271	.....	3,407	.....	3,592	.....	2,096	.....	11,366
Wool, raw	.....	1,685	.....	.....	.....	.....	.....	.....	.....	1,685
Sponges	.....	.....	.....	.....	.....	.....	.....	1,145	.....	1,145
FOREST PRODUCTS	24,258	.....	392	.....	.....	.....	1,794	.....	26,444	.....
Wood	.....	24,258	.....	392	.....	.....	.....	.....	.....	24,650
Valonia	.....	.....	.....	.....	.....	.....	.....	1,794	.....	1,794
MINERALS	38,977	.....	.....	.....	.....	.....	18,345	.....	57,322	.....
Petroleum products	.....	38,977	.....	.....	.....	.....	.....	.....	.....	38,977
Mineral ores	.....	.....	.....	.....	.....	.....	.....	18,345	.....	18,345
MANUFACTURES										
Textile	.....	.....	3,247	.....	856	.....	.....	.....	4,103	.....
Wool mfrs.	.....	.....	.....	3,247	.....	.....	.....	.....	.....	3,247
Cordage	.....	.....	.....	.....	.....	856	.....	.....	.....	856
Other										
Perfumes	.....	.....	6,448	6,448	.....	.....	.....	.....	6,448	6,448
TOTAL PRINCIPAL	618,318	.....	139,442	.....	73,612	.....	119,687	.....	951,059	.....
TOTAL EXPORTS	654,113	.....	156,843	.....	107,707	.....	142,737	.....	1,061,399	.....

* Tables I to VIII compiled by Dr. Grace Fuller, Yale University Library, from tables in *Statistical Abstract for the Principal and Other Foreign Countries* [*Cd. 7525*], London, 1914, pp. 172-183 and 288-295.

these countries can afford to make of food luxuries like sugar and coffee I have calculated by a rough-and-ready method the consumption of those commodities in the years in question and find that the average inhabitant consumed of coffee less than one pound a year, of sugar about eight pounds. The figures for the United States are almost exactly ten-fold that, for either article.[6]

[6] I derived the figures from the imports of 1910-1911, corrected only by taking account of the sugar product and export of Rumania. The exceptionally large output of sugar in Rumania, 1910-1911, would, I am sure, more than make up for the omission of the product of the other Balkan states. Cf. *Statistisches Jahrbuch*, Vol. 35, 1914, Appendix, Table 15. American figures are to be found in *Statistical Abstract of the United States, No. 36*, 1913, pp. 671-672, Table 347.

The Balkan countries imported notably small amounts also of the products of animal industry, forestry, and mining. The sum of these imports, of which coal is the chief item, was about the same as that of the agricultural products, about ten per cent of the total.

There is, it will be remembered, in the figures of imports which I have

TABLE II—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): EXPORTS
(Percentage of value)

	Rumania		Bulgaria		Serbia		Greece		All	
AGRICULTURAL PRODUCTS	82.5	.....	66.5	.....	47.7	.....	67.5	.....	73.97	.....
Food										
Grain and flour	.....	79.5	.....	62.5	.....	32.9	.....	.....	.....	61.18
Fruits	.....	.....	.....	.....	.....	14.75	.....	34.4	.....	6.1
Haricots	.....	2.16	.....	3.16	.....	.....	.....	.....	.....	1.79
Tobacco	.....	.....	.....	.....	.....	.....	.....	10.4	.....	1.4
Wine	.....	.....	.....	.....	.....	.....	.....	10.2	.....	1.37
Cognac	.....	.....	.....	.....	.....	.....	.....	1.6	.....	.22
Olive oil, olives	.....	.....	.....	.....	.....	.....	.....	10.9	.....	1.46
Peas	.....	.33	.....	.....	.....	.....	.....	.....	.....	.21
Sugar	.....	.17	.....	.....	.....	.....	.....	.....	.....	.06
Colza	.....	.....	.....	1.25	.....	.....	.....	.....	.....	.18
Raw Material										
ANIMAL PRODUCTS	2.27	.....	15.78	.....	20.17	.....	2.26	.....	6.02	.....
Food										
Animals	.....	.89	.....	3.96	.....	8.3	.....	.....	.....	1.96
Eggs	.....	.59	.....	7.2	.....	.....	.....	.....	.....	1.42
Meat	.....	.....	.....	.....	.....	8.57	.....	.....	.....	.86
Fish	.....	.2	.....	.....	.....	.....	.....	.....	.....	.12
Cheese	.....	.....	.....	2.46	.....	.....	.....	.....	.....	.36
Raw Material										
Hides	.....	.35	.....	2.18	.....	3.35	.....	1.47	.....	1.04
Wool, raw	.....	.25	.....	.....	.....	.....	.....	.....	.....	.16
Sponges	.....	.....	.....	.....	.....	.....	.....	.8	.....	.11
FOREST PRODUCTS	3.7	.....	.29	.....	.....	.....	1.25	.....	2.49	.....
Wood	.....	3.7	.....	.29	.....	.....	.....	.....	.....	2.32
Valonia	.....	.....	.....	.....	.....	.....	.....	1.25	.....	.17
MINERALS	5.95	.....	.....	.....	.....	.....	12.8	.....	5.3	.....
Petroleum products	.....	5.95	.....	.....	.....	.....	.....	.....	.....	3.66
Mineral ores	.....	.....	.....	.....	.....	.....	.....	12.8	.....	1.72
MANUFACTURES										
Textile	.....	.....	2.3	.....	.8	.....	.....	.....	.39	.....
Wool mfrs.	.....	.....	.....	2.3	.....	.....	.....	.....	.....	.32
Cordage	.....	.....	.....	.....	.....	.8	.....	.....	.....	.08
Other	.....	.....	4.25	.....	.....	.....	.....	.....	.6	.....
Perfumes	.....	.....	.....	4.25	.....	.....	.....	.....	.....	.6
PERCENTAGE PRINCIPAL	94.5	94.09	89.12	89.55	68.67	68.67	83.81	83.82	89.30	88.87

used an undistributed residuum amounting to 30 per cent of the total value, which would doubtless add considerably to the significance of all these classes if it could be properly apportioned among them. It could not, in any event, so change the balance as to give any one of these classes of imports an importance equal to that of the single class of manufactures, which remains to be considered.

The principal items alone, in the class of manufactured wares, amount to nearly one-half (47.8 per cent) of the total imports. They comprise, of course, a varied assortment, supplied by all the different kinds of factories which have developed in modern industrial regions. To one who is interested in the progress of the Balkans the most hopeful feature appears in

the prominence of the metal manufactures among the imports, amounting to about one-fifth of the total purchases made abroad. If, as is the case, the Balkan countries are doing very little as yet to supply their own needs

TABLE III.—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): IMPORTS
(Values in thousands of francs)

	Rumania		Bulgaria		Serbia		Greece		All	
AGRICULTURAL PRODUCTS	15,220	.....	16,441	.....	3,955	.....	53,295	.....	88,911	.....
Food										
Grain	.....	.....	.....	2,826	.....	1,407	.....	44,026	.....	48,259
Coffee	.....	2,576	.....	2,340	.....	1,310	.....	3,323	.....	9,549
Sugar	.....	.....	.....	5,538	.....	421	.....	3,718	.....	9,677
Olive oil, olives	.....	5,961	.....	2,399	.....	211	.....	.....	.....	8,571
Fruits	.....	4,696	.....	2,028	.....	.....	.....	.....	.....	6,724
Tobacco	.....	1,987	.....	.....	.....	.....	.....	.....	.....	1,987
Wine	.....	.....	.....	.....	.....	606	.....	.....	.....	606
Raw Material										
Cotton, raw	.....	.....	.....	1,310	.....	.....	.....	2,228	.....	3,538
ANIMAL PRODUCTS	21,354	.....	5,927	.....	5,300	.....	14,266	.....	46,847	.....
Food										
Fish	.....	5,494	.....	.....	.....	.....	.....	7,166	.....	12,660
Animals	.....	4,575	.....	.....	.....	.....	.....	3,271	.....	7,846
Raw Material										
Hides	.....	5,790	.....	5,927	.....	4,015	.....	3,829	.....	19,561
Wool, wool yarn	.....	5,495	.....	.....	.....	1,285	.....	.....	.....	6,780
FOREST PRODUCTS	.....	.....	6,025	.....	1,082	.....	4,725	.....	11,832	.....
Wood	.....	.....	.....	6,025	.....	1,082	.....	4,725	.....	11,832
MINERALS	7,654	.....	8,414	.....	3,068	.....	19,659	.....	38,795	.....
Coal and coke	.....	7,654	.....	4,057	.....	.....	.....	17,390	.....	29,101
Oil, mineral	.....	.....	.....	3,263	.....	783	.....	1,085	.....	5,131
Salt	.....	.....	.....	1,094	.....	2,285	.....	.....	.....	3,379
Potash, soda, saltpeter	.....	.....	.....	.....	.....	.....	.....	1,184	.....	1,184
MANUFACTURES	126,897	.....	37,105	.....	23,637	.....	17,256	.....	204,895	.....
Textile										
Cotton yarn	.....	24,352	.....	12,570	.....	7,411	.....	956	.....	45,289
Cotton	.....	45,453	.....	16,394	.....	8,810	.....	10,857	.....	81,514
Woolen	.....	32,551	.....	6,089	.....	4,315	.....	4,531	.....	47,486
Silk	.....	16,531	.....	.....	.....	.....	.....	912	.....	17,443
Linen	.....	.....	.....	.....	.....	1,495	.....	.....	.....	1,495
Wearing apparel	.....	3,400	.....	1,561	.....	1,606	.....	.....	.....	6,567
Jute	.....	4,610	.....	.....	.....	.....	.....	.....	.....	4,610
Cordage and twine	.....	.....	.....	491	.....	.....	.....	.....	.....	491
Metal	144,168	.....	28,793	.....	22,006	.....	2,743	.....	197,710	.....
Iron and steel	.....	70,349	.....	13,871	.....	12,701	.....	2,743	.....	99,664
Other metals	.....	.....	.....	.....	.....	3,382	.....	.....	.....	3,382
Machinery	.....	49,187	.....	14,922	.....	5,923	.....	.....	.....	70,032
Vehicles	.....	24,632	.....	.....	.....	.....	.....	.....	.....	24,632
Other	28,758	.....	9,354	.....	10,553	.....	6,718	.....	55,384	.....
Leather, leather manufactures	.....	13,022	.....	2,127	.....	2,363	.....	.....	.....	17,512
Chemicals and drugs	.....	8,881	.....	.....	.....	4,182	.....	.....	.....	13,063
Caoutchouc mfrs.	.....	6,855	.....	.....	.....	.....	.....	.....	.....	6,855
Glass, glassware, earthenware	.....	.....	.....	2,375	.....	1,157	.....	1,966	.....	5,498
Paper	.....	.....	.....	3,026	.....	2,650	.....	4,752	.....	10,428
Soap	.....	.....	.....	1,826	.....	202	.....	.....	.....	2,028
TOTAL PRINCIPAL	344,051	.....	112,059	.....	69,602	.....	118,662	.....	644,374	.....
TOTAL IMPORTS	489,731	.....	188,351	.....	100,061	.....	167,023	.....	945,166	.....

for tools and machinery, they showed at least an appreciation of these needs and an inclination to invest their savings in durable instruments to further their efficiency as producers. If they had been granted ten years of peace since 1910-1911, instead of ten years of war, and had continued to spend

abroad, as they were doing then, some $40,000,000 a year for metals, tools, and machinery, they would be today in a position very different from that which they actually occupy.

TABLE IV—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): IMPORTS
(Percentage of value)

	Rumania		Bulgaria		Serbia		Greece		All	
AGRICULTURAL PRODUCTS	3.1	.....	8.73	.....	4.	.....	31.97	.....	9.8	.....
Food										
Grain	.....	.....	.....	1.48	.....	1.41	.....	26.4	.....	5.26
Coffee	.....	.53	.....	1.25	.....	1.3	.....	1.98	.....	1.1
Sugar	.....	.....	.....	3.	.....	.42	.....	2.22	.....	1.2
Olive oil, olives	.....	1.22	.....	1.3	.....	.21	.....	.....	.....	.9
Fruits	.....	.95	.....	1.	.....	.....	.....	.....	.....	.71
Tobacco	.....	.4	.....	.....	.....	.....	.....	.....	.....	.24
Wine	.....	.....	.....	.....	.....	.6	.....	.....	.....	.06
Raw Material										
Cotton, raw	.....	.....	.....	.7	.....	.....	.....	1.37	.....	.37
ANIMAL PRODUCTS	4.3	.....	3.1	.....	5.3	.....	8.56	.....	5.13	.....
Food										
Fish	.....	1.12	.....	.....	.....	.....	.....	4.3	.....	1.33
Animals	.....	.93	.....	.....	.....	.....	.....	1.96	.....	.78
Raw Material										
Hides	.....	1.18	.....	3.1	.....	4.	.....	2.3	.....	2.3
Wool, wool yarn	.....	1.12	.....	.....	.....	1.3	.....	.....	.....	.72
FOREST PRODUCTS	.....	.....	3.2	.....	1.	.....	2.8	.....	1.24	.....
Wood	.....	.....	.....	3.2	.....	1.	.....	2.83	.....	1.24
MINERALS	1.54	.....	4.5	.....	3.	.....	11.7	.....	4.	.....
Coal and coke	.....	1.54	.....	2.14	.....	.....	.....	10.4	.....	3.01
Oil, mineral	.....	.....	.....	1.76	.....	.78	.....	.65	.....	.54
Salt	.....	.....	.....	.58	.....	2.3	.....	.....	.....	.36
Potash, soda, saltpeter	.....	.....	.....	.....	.....	.....	.....	.72	.....	.12
MANUFACTURES										
Textile	25.76	.....	19.	.....	23.6	.....	10.4	.....	21.13	.....
Cotton yarn	.....	4.95	.....	6.5	.....	7.4	.....	.57	.....	4.8
Cotton	.....	9.3	.....	8.57	.....	8.8	.....	6.5	.....	8.6
Woolen	.....	6.6	.....	3.2	.....	4.3	.....	2.78	.....	4.5
Silk	.....	3.35	.....	.....	.....	.....	.....	.54	.....	1.83
Linen	.....	.....	.....	.....	.....	1.5	.....	.....	.....	.16
Wearing apparel	.....	.69	.....	.82	.....	1.6	.....	.....	.....	.7
Jute	.....	.92	.....	.....	.....	.....	.....	.....	.....	.49
Cordage and twine	.....	.....	.....	.26	.....	.....	.....	.....	.....	.05
Metal	29.4	.....	15.2	.....	22.	.....	1.7	.....	20.9	.....
Iron and steel	.....	14.3	.....	7.3	.....	12.7	.....	1.73	.....	10.55
Other metals	.....	.....	.....	.....	.....	3.4	.....	.....	.....	.36
Machinery	.....	10.	.....	7.9	.....	5.9	.....	.....	.....	7.4
Vehicles	.....	5.1	.....	.....	.....	.....	.....	.....	.....	2.6
Other	5.9	.....	5.	.....	10.6	.....	4.	.....	5.8	.....
Leather, leather manufactures	.....	2.6	.....	1.12	.....	2.4	.....	.....	.....	1.8
Chemicals and drugs	.....	1.9	.....	.....	.....	4.2	.....	.....	.....	1.32
Caoutchouc mfrs.	.....	1.4	.....	.....	.....	.....	.....	.....	.....	.72
Glass, glassware, earthenware	.....	.....	.....	1.25	.....	1.1	.....	1.17	.....	.58
Paper	.....	.....	.....	1.7	.....	2.7	.....	2.85	.....	1.12
Soap	.....	.....	.....	.95	.....	.2	.....	.....	.....	.27
TOTAL PRINCIPAL	69.64	70.1	58.5	59.08	68.7	69.5	70.9	71.27	67.55	68.09

Another group of imported manufactures, about equal in importance to that of the metals, is that of textile products, in which cotton yarn and cloth were the outstanding items. Luxury products, such as silk and linen, were bought in relatively small quantities, and the average inhabitant had but seven cents a year to squander on imported wearing apparel. We may assume, of course, that clothes were made at home, and by like reasoning

we can explain the fact that the average inhabitant spent only two cents a year for imported soap. Unfortunately we cannot make such a liberal allowance for the domestic supply of paper and must note as one of many signs of social backwardness that the average inhabitant spent but twelve

TABLE V—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): IMPORTS FROM OTHER COUNTRIES
(Values in thousands of francs)

FROM	INTO				
	Rumania	Bulgaria	Serbia	Greece	All
Austria-Hungary	117,510	47,893	31,798	21,702	218,903
Germany	161,017	36,978	33,162	13,648	244,805
United Kingdom	71,186	26,358	10,474	37,676	145,694
France	30,494	20,138	4,675	10,151	65,458
Belgium	21,048	6,777	1,491	3,028	32,344
Netherlands	5,312	2,005	634	3,832	11,783
Italy	25,168	7,981	4,253	6,665	44,067
Russia	12,656	6,920	2,608	35,245	57,429
Rumania	.....	7,648	1,359	2,616	11,623
Bulgaria	1,366	.....	590	10,910	12,866
Serbia	381	2,010	.....	.....	2,391
Greece	1,834	454	356	.....	2,644
Bosnia	.....	.....	214	.....	214
Montenegro	.....	.....	57	.....	57
Turkey and Egypt	13,951	18,505	4,875	10,950	48,281
Spain	580	.....	.....	.....	580
Norway and Sweden	.....	372	.....	.....	372
Switzerland	9,628	1,708	1,760	383	13,479
United States	3,258	1,275	1,578	4,177	10,283
Other countries	9,341	1,329	182	6,040	16,892
TOTAL	489,730	188,351	100,061	167,023	940,165

TABLE VI—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): IMPORTS FROM OTHER COUNTRIES
(Percentage of values)

FROM	INTO				
	Rumania	Bulgaria	Serbia	Greece	All
Austria-Hungary	24.	25.4	31.79	12.95	23.2
Germany	33.	19.5	13.16	8.2	25.9
United Kingdom	14.5	13.9	1.05	22.6	15.38
France	6.25	10.6	4.7	6.05	6.95
Belgium	4.3	3.58	.15	1.8	3.42
Netherlands	1.09	1.06	.06	2.29	1.12
Italy	5.15	4.2	4.25	4.	4.65
Russia	2.6	3.66	2.61	21.2	6.15
Rumania	.....	4.5	1.36	1.56	1.23
Bulgaria	.28	.....	.59	6.51	1.35
Serbia	.08	1.06	.....	.....	.25
Greece	.37	.24	.36	.....	.28
Bosnia	.....	.....	.21	.....	.02
Montenegro	.....	.....	.06	.....	.006
Turkey and Egypt	2.35	9.8	4.87	6.15	5.1
Spain	.12	.....	.....	.....	.06
Norway and Sweden	.....	.20	.....	.....	.04
Switzerland	1.96	.9	1.76	.23	1.42
United States	1.69	.67	1.57	2.5	1.6
Other countries	1.91	.69	.18	3.62	1.8
TOTAL	99.65	99.96	68.73	99.66	99.92

cents a year for imported paper of all sorts.

SUMMARY OF BALKAN TRADE

If we attempt now to sum up the character of Balkan trade we may make a composite picture somewhat like the following. The average inhabitant appears as a farmer raising a surplus of food crops which he

markets abroad. This surplus is not very large—almost exactly 61 francs, say $12.00. To him it is of considerable importance, however, for he has not yet learned to make for himself the conveniences of life which are the product of modern machinery and sends this surplus abroad to buy them. He has some debts to pay, which eat up about $1.00 of the surplus, leaving

TABLE VII—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): EXPORTS TO OTHER COUNTRIES
(Values in thousands of francs)

To	From				
	Rumania	Bulgaria	Serbia	Greece	All
Austria-Hungary	50,079	9,197	33,128	12,588	104,992
Germany	28,645	18,565	25,424	15,730	88,364
United Kingdom	44,743	19,776	879	33,431	98,829
France	47,877	10,079	2,516	14,601	75,073
Belgium	244,855	37,367	11,139	9,518	302,879
Netherlands	88,009	1,694	155	10,541	100,399
Italy	59,132	2,883	2,732	9,172	73,919
Russia	6,617	318	34	3,282	10,251
Rumania	.....	1,058	6,355	1,071	8,484
Bulgaria	5,668	.....	3,467	.....	9,135
Serbia	737	509	.....	.....	1,246
Greece	851	9,495	110*	.....	10,456
Bosnia	.....	.....	116	.....	116
Montenegro	.....	.....	17	.....	17
Turkey and Egypt	31,573	36,747†	17,728†	16,134	102,182
Spain	4,024	.....	.....	.....	4,024
Switzerland	153	222	158	.....	533
United States	254	1,142	.....	11,550	12,946
Other countries	40,896	7,791	3,750	5,118	57,555
TOTAL	654,113	156,843	107,708	142,736	1,061,400

† Does not include Egypt. * 1911 only; figures for 1910 not given.

TABLE VIII—COMMERCE OF BALKAN COUNTRIES, 1910-1911 (Average): EXPORTS TO OTHER COUNTRIES
(Percentage of value)

To	From				
	Rumania	Bulgaria	Serbia	Greece	All
Austria-Hungary	7.65	5.85	30.8	8.8	9.8
Germany	4.4	11.8	23.6	11.	8.3
United Kingdom	6.8	12.6	.82	23.4	9.3
France	7.3	6.4	2.32	10.2	7.1
Belgium	37.5	23.8	10.3	6.7	28.2
Netherlands	13.5	1.08	.14	7.39	9.4
Italy	9.	1.83	2.52	6.4	7.
Russia	1.01	.2	.03	2.3	.96
Rumania	....	.66	5.9	.75	.8
Bulgaria	.86	....	3.2	....	.86
Serbia	.11	.35	....	.12	.12
Greece	.13	6.1	.1	....	.98
Bosnia	....	....	.108	....	.01
Montenegro	....	....	.01	....	....
Turkey and Egypt	4.8	23.4	15.9	11.2	9.6
Spain	.61	....	....	....	.38
Switzerland	.02	.14	.15	....	.04
United States	.04	.75	....	8.07	1.22
Other countries	6.25	4.95	3.5	3.58	5.45
TOTAL	99.98	99.91	99.398	99.91	99.52

$11.00 that he lays out on barbed wire, bar iron, shovels, and plows; on calico and canvas; and, to a very modest extent, on some simple table luxuries.

This picture makes more intelligible to my mind some features in the direction of Balkan commercial currents which are striking and which at

first glance appear puzzling. The countries of the peninsula did little business among themselves or with most of their immediate neighbors. They did little business with distant continents. They carried on most of their trade, about three-quarters of the total, with the countries to the north and northwest, of which only one is immediately adjacent.

In this aspect the Balkan country clearly resembles the farmer. Farmers do little trading among themselves. The possessor of a good orchard or of a particular vineyard will find in the neighborhood some sale for his surplus product, but the farming class as a whole looks to the city for its

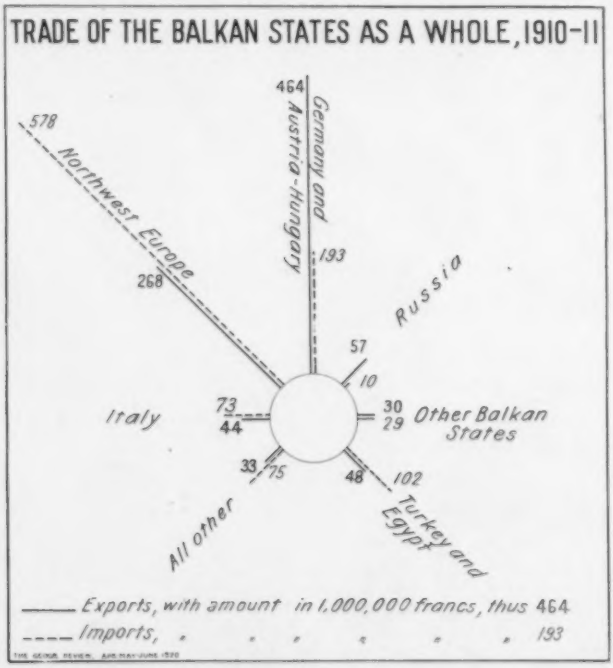

FIG. 1.—Diagram showing the amount and the destination and provenance of the exports and imports of the Balkan states as a whole, 1910-1911. (N. B.: The symbols for exports and imports should be reversed.)

market and its source of supplies. To the Balkan farmer the city is the dense industrial population of northwestern Europe, demanding bread and meat and offering manufactured wares in payment.

Similar considerations help to explain the anomalous distribution of exports and imports along the axes of greatest commercial activity, to the north and northwest. The Balkan exports to northwestern Europe were more than double the imports from that source; the imports from Germany and Austria-Hungary were more than double the exports to that market (Fig. 1). Why is there not a closer approximation to a balance in the

trade with each particular region? As regards exports the answer can be given with some confidence. The British and Belgians and Dutch welcome bread and wheat and are glad to get it from any source. The Germans and Austrians have much farm land of their own and put in the way of food imports obstacles that are sufficient to divert part at least of the trade current of those articles to other countries.

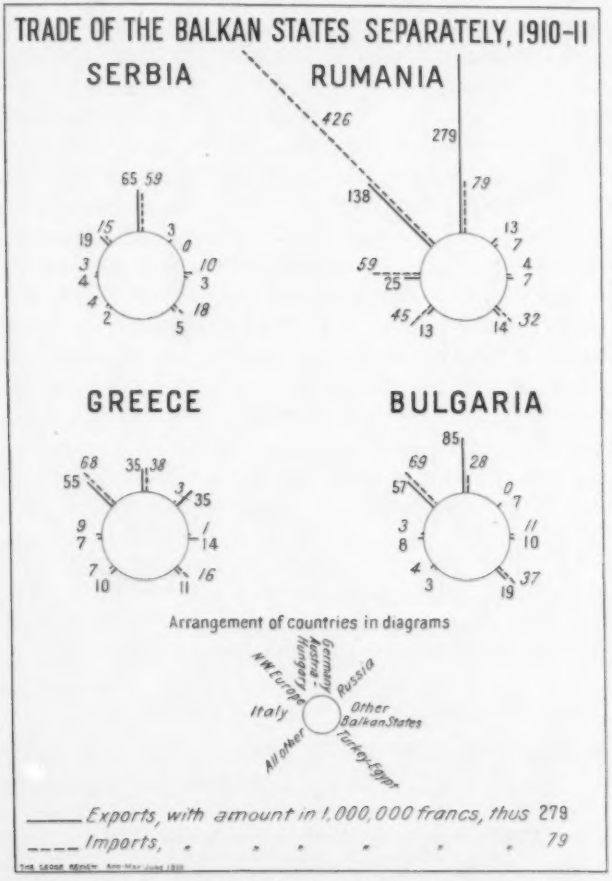

FIG. 2.—Diagram showing the amount and the destination and provenance of the exports and imports of the Balkan states separately, 1910-1911. (N. B.: The symbols for exports and imports should be reversed.)

COUNTRIES TRADED WITH

As regards imports into the Balkans, of which almost exactly one-half come from Germany and Austria-Hungary, the answer is less obvious. These imports are, with negligible exceptions, standard wares, produced by several different countries. Why did not the English or the French or

the Belgians, rather than the German-speaking peoples, supply the goods?

They did in fact do so, in large measure, until a comparatively recent period, in which Germany made an astonishing advance. The reasons for the change are intricate, and I shall merely state a personal opinion without seeking to support it in detail. I am inclined, as will appear later, to regard the element of geographical proximity enjoyed by the German-speaking peoples as an advantage in the Balkan market, but one on the whole of secondary importance. It did not give the Germans a commanding position in the Balkans in the past; it will not necessarily assure them such a position in the future.

The Germans have had the trade because they have wanted it more than other peoples wanted it and have gone after it; it did not come to them of itself. Their commercial travelers have explored the region, studied its wants, bestirred themselves to get the right goods, talked business in the language of the country, and offered generous credit. These facts, rather than geographical position or the bluster of commercial policy or superior industrial efficiency, seem to me to explain the hold which the German-speaking peoples had obtained on the Balkan market.

A student of the commercial geography of the Balkan Peninsula desires, of course, to know not only the general character and volume of the trade currents flowing in and out; he would like to distinguish the path of each current and determine the relative importance of the gateways by which trade enters and leaves the peninsula. He finds, however, that the statistical sources of Balkan governments are neither complete nor uniform, and he must be content with the indications given him by the trade of particular countries, inside and outside the peninsula. Fortunately the two countries which have had the largest part in the commerce of the Balkans, Germany and Austria-Hungary (each having about one-sixth), afford means of reaching some preliminary conclusions in the matter.

Trade with Austria-Hungary

Austria-Hungary has been used to distinguish that part of the trade of the monarchy which was carried on by sea, via the Adriatic ports, and

Table IX—Trade of Austria-Hungary with Balkan Countries, 1912
(Amounts in millions of crowns)

Country Traded With	Total Imports	Including Sea Trade	Per Cent of Sea Trade	Total Exports	Including Sea Trade	Per Cent of Sea Trade
Serbia	40	0	0	43	0	0
Rumania	102	8	8	134	1	1
Bulgaria	15	1	7	47	4	9
Greece	23	23	100	22	21	95
Turkey in Europe	97	78	80	42	34	81
Total	277	110	40	288	60	21

Statistik des auswärtigen Handels, 1912, Vol. 1, pp. 990, 1052.

furnishes therefore a means of testing the route of the wares exchanged with an immediate neighbor of some of the Balkan states.

Two countries of the Balkans have in the past been at opposite poles as regards the means of commercial approach to them. One, Serbia, lacking any access to the sea, could be reached only by land routes or by internal waterways. The other, Greece, until May, 1916, lacked any railroad connection with the continental lines and therefore was dependent on the sea for practically all its foreign trade. As regards the other states it is apparent that the farther removed they were from Austria-Hungary the more did the greater expense of rail transport, mile for mile, tell in favor of the sea route.

The fact that sea traffic in the export trade had only half the relative importance it showed in importation is due, of course, to the contrast of raw materials and finished manufactures, presenting a great difference in the value of a given bulk.

The smaller part (one-fifth to two-fifths in value) of the commerce of Austria-Hungary with the Balkan states was carried on by sea. We have now to distinguish, if possible, the relative importance of the railroad and of internal waterways in carrying the bulk of the traffic.

Hungarian Trade

Statistics which would make possible an exact analysis are lacking. It is necessary, in the first place, to omit from consideration the trade of the Kingdom of Hungary with the Balkans. This is not so serious as appears at first, when one thinks of the propinquity of Croatia-Slavonia to Serbia and of Transylvania to Rumania. Actually the trade of the Hungarian half of the monarchy with the Balkan states has been very small. Hungary is too much like the Balkan states in its economic development to give rise to those contrasts in the productive organization from which the gains of trade arise. In the period from 1908 to 1912 it carried on from one per cent to three per cent of its trade with Rumania, from one per cent to two per cent with Bosnia, and only exceptionally as much as one per cent with any other Balkan country.[7] This situation is intelligible when one reviews the leading imports and exports of Hungary. In order of importance (values), in 1912 the exports were flour, oxen, wheat, hogs, wine, raw sugar, rye, barley, timber, oats, refined sugar; these composed half of the total. These products, in general, compete with Balkan products and would find but a poor market in the peninsula. On the other hand, the imports of the Kingdom of Hungary were mainly manufactured wares (textiles, clothing, leather, shoes) and raw materials like coal, cotton, rice, and coffee; the list is much like the list of imports into a Balkan state.[8]

[7] *Ungarisches Statistisches Jahrbuch 1912*, Budapest, p. 224.

[8] *Ibid.*, p. 226 *et seqq.*

Austrian Trade

Even for the Austrian half of the monarchy, however, complete figures are not available. The best that we have are the statistics of the Donau-Dampfschiffahrts-Gesellschaft, the most important navigation company operating on the Danube and its tributaries, carrying certainly more than half of the total tonnage, possibly five-sixths.[2] If we double the figures of the Balkan freight that this company loads and unloads in the Austrian half of the monarchy I believe that we shall have a fair approximation to the total river traffic of Austria-Hungary with Balkan countries, and I have constructed a table (Table X) on the basis, using for comparison the total commercial tonnage of trade, sea-borne and terrestrial, supplied by the commercial statistics. The difference between the figures gives, of course, an approximate idea of the trade carried by the railroads.

Table X—Trade of Austria-Hungary with Balkan Countries, 1912 *
(Quantities in thousands of metric tons)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Trade	River Trade of D-D-G.	Total by River	Per Cent	By Rail	Per Cent	By Sea	Per Cent
Imports From								
Serbia	175	19.6	39	22	136	78	0	0
Rumania	776	17.8	36	5	680	88	60	8
Bulgaria	64	7.4	15	23	41	64	8	13
Greece and Turkey	199	0.1	0.2	0	28.8	15	170	85
Total	1,214	....	90.2	7	885.8	74	238	20
Exports to								
Serbia	188	37.8	76	40	112	60	0	0
Rumania	516	19.7	39	7	473	92	4	1
Bulgaria	107	15.3	31	29	68	64	8	7
Greece and Turkey	137	0.9	2	1	10	7	125	91
Total	948	....	148	16	663	70	137	14
Total Exports and Imports	2,162	....	238.2	11	1,548.8	72	375	17

* Figures for the river trade are taken from *Österreichische Statistische Mitteilungen*, Vol. 7, 1913, p. 86, and refer to the year 1912, as do the figures for total trade and for sea trade taken from *Statistik des auswärtigen Handels*. Figures in column (3) are, of course, mere approximations, and the same must be said of figures under (5), which are remainders obtained by adding the figures under (3), river trade, and (7), sea trade, and subtracting the sum from the figures under (1), total trade. There are obvious objections to fusing statistics of *trade* and of *transportation*, as I have done both for Austria-Hungary and for Germany, but no other means appears by which to reach the end desired.

One feature of this table which appears to me to deserve the greatest emphasis is the indication that it gives of the relative unimportance of the Danube as an avenue of access to Balkan trade. That river traverses the heart of Austria and of Hungary; it provides a direct means of approach to three of the Balkan countries, including Rumania, which has by far the greatest commercial importance of all of them. Yet if we view the Balkan trade of Austria-Hungary in the aggregate the river provides a service which is inferior to that of the sea and immensely less than that of the railroad. Suppose the river to be blocked above its confluence with the

[2] Cf. figures in *Oesterreich. Statistisches Handbuch 1909*, p. 344 *et seqq.*

Save—how serious would be the effect on the Balkan trade of Austria-Hungary? Commerce with Greece and Turkey would follow the sea route, as in the past. The sea and the railroad, between them, would readily provide carriage for most of the remainder of the trade. The districts most injuriously affected, so far as the statistics show, would be Serbia on the Danube, and Bosnia on the Save; in the aggregate they are not of great importance.[10]

Trade with Germany

Let us consider now, in a similar manner, the trade of Germany with the Balkans. Germany was in the years 1910-1911 the leading country of the world as regards the value of trade with the four Balkan states whose statistics have been analyzed. Germany has not the peculiar advantage of propinquity enjoyed by Austria-Hungary. It does have some advantage of position over the other industrial states of northwestern Europe; it will be interesting to determine how far these advantages account for its supremacy in Balkan trade. Finally, Germany offers admirable statistical

Table XI.—Trade of Germany and Balkan Countries, 1910 *
(In thousands of tons)

	Total Trade	By Waterway	Per Cent	By Railway	Per Cent	Remainder (By Sea)	Per Cent
Imports into Germany from							
Rumania	550.8	27.6	5	27.9	5	495.3	90
Other Balkan States	306.5	68.0	22	32.7	11	205.8	67
Total	857.3	95.6	11	60.6	7	701.1	82
Exports from Germany to							
Rumania	168.6	3.6	2	86.9	52	78.1	47
Other Balkan States	263.5	20.5	8	53.5	21	189.5	72
Total	432.1	24.1	6	140.4	32	267.6	62
Total Exports and Imports	1,289.4	119.7	8	201.0	16	968.7	75

* I have compiled the figures for the total trade from *Statistik des Deutschen Reichs*, Vol. 252, Auswärtiger Handel, Parts IV and VII, Table A, Spezialhandel nach Warengruppen, taking the figures for 1910. Tonnage carried on internal waterways in 1910 is analyzed in the same series, Vol. 245, Part I, Verkehr der deutschen Binnenwasserstrassen. Extraordinarily complete figures of traffic by rail are provided in *Statistik der Güterbewegung auf deutschen Eisenbahnen nach Verkehrsbezirken geordnet;* as the last volume available to me was that for 1910, I have taken the other figures also for that year.

[10] Transport by Donau-Dampfschiffahrts-Gesellschaft, 1912:

Thousands of tons

	Imports from	Exports to
Serbia on Danube	14.5	37.2
Serbia on Save	0.5	0.5
Bosnia	22.8	9.7

The commercial statistics of Bosnia-Hercegovina do not distinguish the trade with Austria-Hungary from the trade with other countries but do give the proportions of the total external trade carried by different means of transportation. The following figures are simple averages of the percentage figures of the two years, 1910 and 1911.

Bosnia-Hercegovina, 1910-11, percentage of tonnage

	Imports	Exports	Total
Railroads	81	72	74
River trade	9	17	15
Roads and ferries	9	11	10
Direct trade with Serbia, Turkey, Montenegro	0.7	0.0	0.2

Cf. A. Korompay: Der auswärtige Warenverkehr Bosniens und der Herzegowina im Jahre 1911 im Vergleiche mit den Jahren 1910 und 1907, *Statistische Monatschrift*, Vol. 40, 1914, pp. 232-241: reference on p. 240.

material for a study of its transportation system and is the only Continental state having important commercial relations with the Balkan countries that gives definite information on the means by which it trades with them. The significant figures are summarized in the preceding table (Table XI).

Comparing the Austrian and the German figures we find that the more distant country does a distinctly smaller business measured in gross tonnage; the value of the German trade is about the same, however, by reason of its superiority in industrial exports, in which value is condensed in a

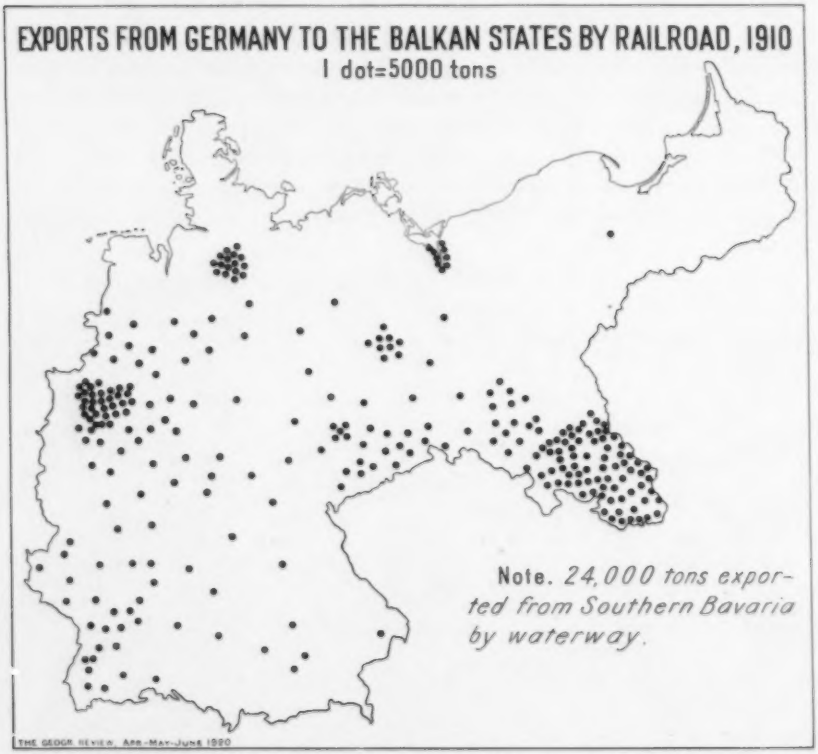
EXPORTS FROM GERMANY TO THE BALKAN STATES BY RAILROAD, 1910
1 dot=5000 tons
Note. 24,000 tons exported from Southern Bavaria by waterway.

FIG. 3—Cartogram showing the amount and provenance of the exports by railroad from Germany to the Balkan states, 1910.

relatively small bulk. Analyzing the different modes of transport employed we find that internal waterways appears in the third place in both tables and were, naturally, of less importance in Germany than in Austria. The most striking feature is the reversal of the parts played respectively by the railway and by the sea. Of the Austrian trade 72 per cent went by rail and 17 per cent by sea; of the German trade 75 per cent went by sea and 16 per cent by rail. The figures here are based on tonnage, not on value, and would not be so curiously divergent if we had a better economic measure

than that of mere weight. Taking the figures as they stand, however, some obvious conclusions result from them.

Value of the Danube River as a Trade Route

Germany has an advantage over competitors for Balkan trade in northwestern Europe in her ability to make at least some use of the Danube route. It will be noted that Germany actually drew a larger tonnage up the Danube in 1910 than did Austria-Hungary in 1912. More extensive study of the statistics might show this comparison to be exceptional and misleading. Some reason for it appears, however, in the character of the wares brought by this route; they consisted largely of cereals, for which the demand is more active in southern Germany than in Austria. The exports from Germany by this route were a varied assortment; about half the tonnage was composed of iron and steel and metal wares. One item on the list is of interest because it presents so characteristic an example of the paradoxes of commerce: 800 tons of rice shipped from Bavaria to the Balkans! In general, the wares shipped downstream as well as upstream

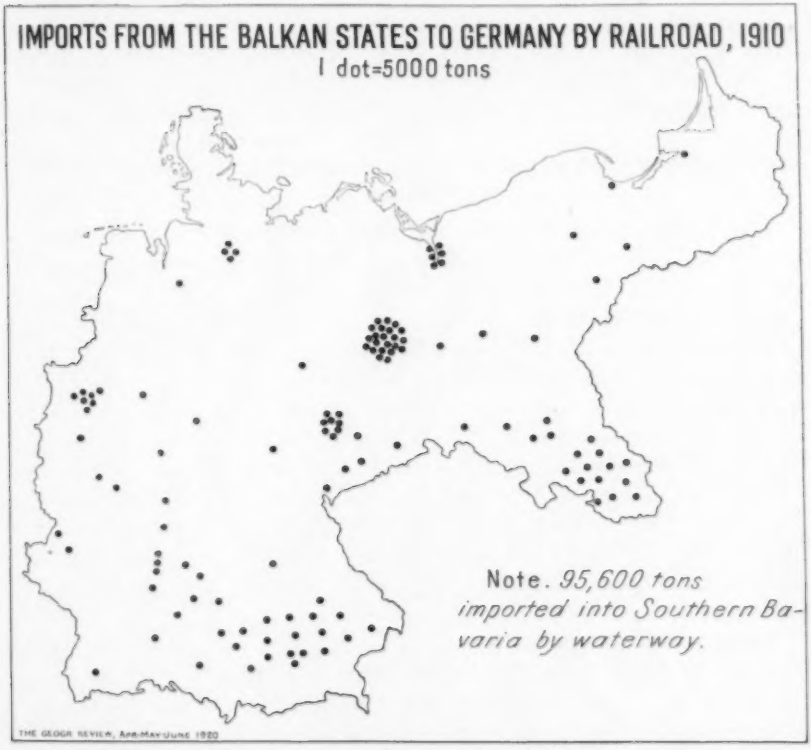
IMPORTS FROM THE BALKAN STATES TO GERMANY BY RAILROAD, 1910
1 dot=5000 tons
Note. 95,600 tons imported into Southern Bavaria by waterway.

Fig. 4—Cartogram showing the amount and destination of the imports by railroad from the Balkan states to Germany, 1910.

seem to have been of the kind that usually would be carried by sea.

A study of the statistics of traffic on the internal waterways of Germany shows that the Danube outlet to the Balkan countries is of importance mainly to southern Bavaria. Not a ton of Balkan freight appears to have passed into or out of the basin of the upper Danube, coming from or going to other German waterways. Even the regions of the Ludwig Canal, the Main, and the Rhine show no water-borne freight movement connecting by the Danube with Balkan countries.

It is possible, of course, that some of the considerable tonnage of iron and steel which went down the Danube reached that river in small canal boats via the Rhine, Main, and Ludwig Canal and was there transferred to river boats. The traffic statistics do not enable us to answer this question. They consider only the immediate, not the ultimate, destination of wares.

Comparative Value of Rail and Water Routes in German-Balkan Trade

Comparing now the waterway and the railway as an instrument to serve German commerce with the Balkans, we find that the railway does twice the work of the waterway, measured in tonnage of wares carried. The peculiar advantage of the railway is its relative independence of natural contours and its ability to follow a fairly straight path into any region that is not actually mountainous. While the Danube serves but a small part of Germany in its Balkan trade, the railway serves all Germany.

This fact stands out clearly when we study the districts in Germany in which most of the Balkan railroad freight arrives and departs (Figs. 3 and 4). The agricultural districts do little or no business with Balkan countries, being indeed their competitors. The industrial districts are the source of most of the outgoing freight to the Balkans, and the incoming freight goes in large part to the consuming population gathered in them and in the large cities.

When we seek to analyze the nature of the trade which Germany carries on with the Balkan countries by sea—three-quarters of the whole—we encounter practical difficulties. We may assume, of course, that all the trade with Greece went by the sea route, and it is safe to assume that most of the trade with Turkey in Europe followed the same course. All of the trade of Serbia was, of course, by land. To Bulgaria and Rumania wares could be shipped by sea or by railway or by internal waterway; we want to know which of these routes was followed by any particular ware and the reason why it chose this particular course. By combining and analyzing the statistics of traffic and of commerce an answer to the question may be obtained which will be approximately correct; but the process is a tedious one, and I shall attempt to present here merely impressions based on a partial study of the figures, not the conclusions of an exhaustive analysis.

In general I have the impression that any given ware might be shipped and was shipped by any one or by all three of the routes. The choice would apparently be determined not by the character of the article, except for such wares as fresh fruit, counting for little in the aggregate; it would be determined by the particular place in which the article originated, by the particular place of its destination, and by the particular time at which it was shipped. For example, the iron product from the region of Oppeln in Silesia went to Rumania by rail; it had a longer rail haul than if it had been taken to a seaport or to the Danube but escaped the costs of transshipment and water freight and could probably be laid down nearer the place where it was wanted than would be the case if it had been carried by a water route. Most of the iron that was exported to Serbia seems to have gone down the Danube and was probably distributed from Belgrade. This was probably manufactured in the Ruhr region; and from the same source doubtless went the bulk of the iron wares that were shipped to the peninsula by sea.

Seeming Anomalies in Freight Routing

It is disconcerting, however, to find a shipment by rail to Rumania of 2,000 tons of steam boilers and tanks from the Pomeranian harbors, directly on the seaboard; and this example is but one of many that could be given of the defiance of theories by the facts. A reason doubtless lies behind every movement of freight, however insignificant it appears; but the reasons are often obscure because they are local and individual. They may result from the particular circumstances of the time, rather than of the place or of the ware. Part of the freight exchanged by railroad between Germany and the Balkan countries consisted undoubtedly of "rush" shipments. How large a part of the rail traffic was of this sort it is impossible to say. This part of the rail traffic, shipped in response to hurry-up orders, was probably of shifting character, composed at different times of different goods, according to the circumstances.

Furthermore, we must recognize that the influence of economic competition often diverts trade currents into lines which appear unnatural and socially disadvantageous. Much has been written on the service of trusts and similar would-be monopolies in organizing more efficiently the distribution of wares, abolishing the losses of cross-freights, etc.; but there is another side to the picture. Fierce competition, resulting in price cutting, "dumping," etc., will often make trade currents, in appearance, run up hill. A German *kartell*, dominating the market in some particular product, can exercise more influence than lofty mountain chains or level river valleys can exercise on the direction of traffic; and for a considerable period may exercise this influence, to the confusion of commercial geographers. Some German *kartells* have regularly framed their prices so as to counteract transportation charges, charging prices that were lower as regions

were farther away, and so practically annihilating the effects of distance.[11] Foreign territory has usually been left open to the unrestricted competition of the members of a trust and their rivals,[12] but it would certainly be unsafe to assume that in Germany's Balkan trade influences of this kind were wholly wanting.

Reasons for Germany's Dominance in Balkan Trade

Looking away from the bewildering mass of detail and seeking some general conclusion, I think the following statements are clearly true. Germany has a particular advantage in Balkan trade both in the waterway of the Danube and in the railroad connections which bring her closer than her industrial competitors to the Balkan markets. On the other hand, with

Fig. 5—Cartogram showing the amount of export and import trade of Bulgaria by custom houses, 1911. (N. B.: The figures for exports and imports should be reversed.)

the choice of ways before her, Germany has carried on only one-fourth (in tonnage) of her Balkan commerce by the Continental route. For three-fourths of the trade she has chosen the open sea.

In two aspects this situation seems to me to be highly significant. In

[11] The Heimstädter-Braunkohlenbrikett-Syndikat furnishes an illustration:

Zone	Price
I	61
II	56
III	51
IV	48

Similar practices will be found in the German metal industries. Cf. Hugo Bonikowsky: Der Einfluss der industriellen Kartelle auf den Handel in Deutschland, Jena, 1907, p. 150.

[12] Josef Grunzel: Ueber Kartelle, Leipzig, 1902, p. 64.

the first place, it indicates that Germany's industrial neighbors, Belgium, France, and England, which appear to be hampered by the greater length of the overland route, are actually better situated than Germany to compete in three-fourths of the Balkan trade which Germany carries on. There is, I think, a fair measure of truth (though not all the truth), in the statement that Germany carries on overland trade with the Balkans because of the *disadvantages* of her position. Part of the German trade takes to the river route and the railroad because the producing and consuming districts

TABLE XII.—GATEWAYS OF BULGARIAN TRADE, 1911 *
(Values in millions of francs)

	TOTAL	N	NW	W	SW	SE	E	NE
IMPORTS								
Orient R. R.	66.2	40.8	18.5	0.9	2.3	2.6	0.2	0.7
River	46.1	25.9	7.4	1.4	1.4	0.6	7.4	2.0
Sea	85.3	21.3	34.0	6.8	6.5	11.2	1.2	4.3
Turkish	1.6	0.1	0.0	0.0	0.0	1.5	0.0	0.0
Total	199.3	88.1	60.0	9.1	10.5	16.0	8.7	7.0
EXPORTS								
Orient R. R.	28.2	18.1	4.3	2.4	1.6	1.6	0.0	0.2
River	53.7	10.7	37.4	0.0	4.0	0.1	1.1	0.1
Sea	90.5	4.6	47.3	1.5	21.5	15.4	0.1	0.0
Turkish	12.1	0.1	0.0	0.0	0.0	12.1	0.0	0.0
Total	184.6	33.5	89.1	3.9	27.3	29.2	1.2	0.3
Combined Total	383.9	121.6	149.1	13.0	37.8	45.2	9.9	7.3

* Symbols heading the vertical columns have the following significance: N, Austria-Hungary, Germany; NW, England, France, Belgium; W, Italy; SW, Scattering, not otherwise specified; SE, Turkey; E, Rumania; NE Russia.

Custom houses are grouped as follows in the horizontal lines of figures: Orient Railroad includes Tsaribrod, Sofia, Plovdiv (*not* Harmanly); River includes Vidin, Lom, Oryekhovo, Somovit, Nikopol, Svishchov, Rushchuk, Tutrakan, Silistra; Sea includes Kavarna, Balchik, Varna, Burgas; Turkish includes Kyustendil, Kocharinovo, Chepelare, Harmanly, Vakaf, Kozlets (Mandra) Kaibilyar.

The table is compiled by grouping figures supplied in *Statistique du Commerce du Royaume de Bulgarie 1911*, Sofia, 1914, Table 14. Figures in the table are merely approximations in gross; considerable discrepancies will appear when the vertical column of totals is checked by the sum of items in the horizontal lines.

in Germany are so far from deep-water harbors that they cannot afford to take the sea route. Manchester and Middlesbrough, Roubaix and Lille are better situated for Balkan trade than Essen and Oppeln, Solingen and Chemnitz.

In the second place, looking at the matter from the standpoint of Balkan countries, these considerations indicate that the first requisite for their commercial prosperity is not a Continental connection by railroad or river but good harbors on the open sea with ready access to the interior. Balkan trade currents flow northwest and north, but they reach their destination by starting in the opposite direction, southeast and south, and make a great curve to reach their final objective.

BULGARIA AS AN EXAMPLE FOR THE ANALYSIS OF TRADE CURRENTS

The matter will be more evident if we study in detail the trade currents of a particular Balkan country. Let us take Bulgaria, which is well adapted to our purpose since it has direct railroad and river connections with the

Continent and an outlet through the Black Sea and the Straits. Bulgarian trade statistics fortunately provide the means of analyzing in detail the trade currents flowing in and out through different gateways, and the accompanying table and map (Table XII and Fig 5) present a compilation from them designed to illustrate this point.

The table shows that Bulgaria depends upon the Orient Railroad for about one-third of its import trade; most of the wares arriving by this route come from Austria-Hungary and Germany, are entered at Sofia, and are consumed in the capital or are distributed from there. Harmanly is a station on this road, but its trade is almost entirely with Turkey, and I have therefore grouped it with the other custom houses on the Turkish frontier. For export purposes the railroad is relatively unimportant.

A slightly larger proportion of the aggregate trade enters and leaves the country by the river ports. Two points are to be noted, however, in judging the significance of the figures under this head in the table. More than half of the import trade of the river ports passed through Rushchuk, which is a connecting point with the Rumanian railroads and which probably received more goods by rail than by water. Furthermore, an analysis of the exports leaving by the river gateways shows that a relatively small part could have gone upstream and that the largest part, destined for Belgium and England, must have gone downstream and been shipped by sea. Even Vidin, for example, which lies only a short distance below the Iron Gate, exported (in thousands of francs) only 275 to Austria-Hungary and only 16 to Germany, while it exported 1,100 to England and 5,298 to Belgium. The Danube serves Bulgaria, evidently, as an outlet to the sea rather than as a means of access to Central Europe.[13]

Even if no allowance be made for the maritime traffic concealed in the figures of trade by the river ports, the statistics of exports and imports by sea take the place of preponderant importance. It should be noted that these figures were compiled at a time when Bulgaria had no access to the Aegean except through Turkish territory. Leaving aside the question of the importance to Bulgaria of the Dedeagach outlet, it is apparent that even the route through the Black Sea, which is apparently so roundabout, was distinctly superior in economic value to the direct connections by rail and river.

A study of the figures of the commerce of Rumania leads to the same conclusion as regards that state.

[13] This conclusion is borne out by the statistics of tonnage and nationality of shipping on the Danube blished in the *Annuaire Statistique du Royaume de Bulgarie*.

THE NEW BOUNDARIES OF BULGARIA

The status of the peace treaties terminating the war was discussed in a note in the December, 1919, *Geographical Review* (pp. 357-358). It was there stated that the third treaty signed was the treaty with Bulgaria, signed at Neuilly on November 27, 1919. The full official text was not then available. It has since become available,[1] and the territorial provisions (Article 27) are herewith reprinted from it. The segments of the boundary which differ from the pre-war boundary were identified and plotted on the proper sheets of the standard Austrian staff map entitled "Generalkarte von Mitteleuropa, 1:200,000" and were then reduced and transferred to the accompanying map (Fig. 1). The names of all the geographical features mentioned in the treaty text are shown on the main map or on the insets.

In the following reprint each two paragraphs describing a segment of the boundary in the original have, for the sake of clearness, as in our reprint of the Austrian treaty (December, 1919, *Review*), been combined into one paragraph throughout. Also, in footnotes is given the spelling of the Austrian staff map of all names which differ from it in the treaty text. On the Austrian map the Croatian alphabet is used to transliterate Bulgarian names. In the treaty text the accent ˇ of this alphabet is omitted. Thus a *c* may stand for its (Croatian) sound of *ts* or, with accent omitted, of *ch*, an *s* for an *s* or *sh* sound. To add to the confusion, some names, as Topolovitsa (Croatian: Topolovica), Dragovishtitsa (Croatian: Dragovištica), are transliterated according to English phonetics, and one name, that of the Maritsa River, occurs in both forms in the text. Inasmuch as the Austrian map has obviously been used as a basis for the definition of the boundary, it has been thought best to accept its spelling as standard.

ARTICLE 27

The frontiers of Bulgaria shall be fixed as follows (see annexed map):

1. *With the Serb-Croat-Slovene State:*

From the confluence of the Timok and the Danube, which is the point common to the three frontiers of Bulgaria, Rumania, and the Serb-Croat-Slovene State, southwards to a point to be selected on the course of the Timok near point 38 west of Bregovo, the course of the Timok upstream;

thence southwestwards to the point east of Vk. Izvor where the old frontier between Serbia and Bulgaria meets the river Bezdanica, a line to be fixed on the ground passing through points 274 and 367, following generally the watershed between the

[1] Traité de paix entre les puissances alliées et associées et la Bulgarie signé a Neuilly le 29 novembre 1919. iv+iii+iv+393 pp. [Paris, 1919]. 12½x8½ inches. Text in French, English, and Italian. Accompanied, in pocket, by map, 1:1,000,000, showing the new boundaries on a transfer of a section of the Royal Geographical Society's map of Europe on that scale.

THE NEW BOUNDARIES OF BULGARIA
Based on Art 27 of the Treaty of Neuilly signed November 27, 1919
Scale 1 3,500,000
TIMOK VALLEY
TSARIBROD AND BOSILEGRAD DISTRICTS
STRUMITSA DISTRICT
BOUNDARY AT ADRIANOPLE ACCORDING TO TREATY OF SOFIA 1915
New boundaries of Bulgaria
1886 Former " " " with year of establishment
All the geographical features mentioned in the treaty text to define the boundary are shown on the map
Vidin
Berkovitsa
Vratsa
Pirot
Tsaribrod
Bryeznik
SOFIA
Phyeven (Plevna)
Svishtchov
Djurdjiu
Ruse (Rushtchuk)
Tutrakan
Silistra
Constantsa
Dobritch
Baltchik
Shumen (Shumla)
Varna
Trnova
Karlovo
Sliven
Burgas
Stara Zagora
Bosilegrad
Kyustendil
Kriva Palanka
Plovdiv (Philippopolis)
Stanimaka
Mustafa Pasha
Adrianople (Edirne)
Kirk Kilisse
Strumitsa
Kuchuk Derbend
Doiran
Seres
Drama
Gümürdjina
Kavala
Dedeagatch
Thasos
Enos
AEGEAN SEA
BLACK SEA
ALKANTRANGE
PIRIN RANGE
RHODOPE MTS

FIG. 1

THE TERRITORIAL DEVELOPMENT OF BULGARIA, 1878-1919
1 : 15,000,000
1878
(July 13)
Creation of the Principality of Bulgaria under Turkish suzerainty.
Proposed boundary according to Treaty of San Stefano (March 3, 1878)
1885
Union of Eastern Rumelia with Bulgaria
1886
Recession of (1) Rhodope district (upper Krichma valley) and (2) Kirdjali district to Turkey.
(Bulgaria independent kingdom since Oct 5, 1908)
1913
Acquisition of (1) Strumitsa valley, (2) Rhodope Mts. region, (3) access to Aegean Sea, (4) basin of Golyema R.
Loss of (5) southern Dobrudja.
1915
Acquisition of (1) Adrianople district and (2) left bank of Maritsa R.
1919
Loss of (1) Timok, (2) Tsaribrod, (3) Basilegrad, (4) Strumitsa, (5) Adrianople districts, and of (6) access to Aegean Sea.
THE GEOGR. REVIEW, APR-MAY-JUNE 1920

FIG. 2.

basins of the Timok on the northwest and the Topolovitsa[2] and Delejna on the southeast, leaving to the Serb-Croat-Slovene State Kojilovo, Sipikovo, and Halovo, with the road connecting the two latter places, and to Bulgaria Bregovo, Rakitnica, and Kosovo;

thence southwards to point 1720, about 12 kilometers west-southwest of Berkovitsa,[3] the old frontier between Bulgaria and Serbia;

thence southeastwards for about 1½ kilometers to point 1929 (Srebrena gl.), a line to be fixed on the crest of the Kom Balkan;

thence south-southwestwards to point 1109, on the Vidlič[4] Gora south of Vlkovija, a line to be fixed on the ground passing through points 1602 and 1344, passing east of Grn. Krivodol and crossing the river Komstica[5] about 1½ kilometers above Dl. Krivodol;

thence to a point on the Tsaribrod[6]-Sofiya road immediately west of its junction with the road to Kalotina, a line to be fixed on the ground passing east of Mözgos,[7] west of Stanineі, east of Brebevnica, and through point 738 northeast of Lipinci;

thence west-southwestwards to a point to be selected on the course of the river Lukavica about 1,100 meters northeast of Slivnica, a line to be fixed on the ground;

thence southwards to the confluence, west of Visan,[8] of the Lukavica with the stream on which Dl. Nevlja is situated, the course of the Lukavica upstream;

thence southwestwards to the confluence of a stream with the Jablanica, west of Vrabca,[9] a line to be fixed on the ground passing through point 879 and cutting the road from Trn to Tsaribrod immediately south of the junction of this road with the direct road from Trn to Pirot;

thence northwards to the confluence of the Jablanica and the Jerma (Trnska), the course of the Jablanica;

thence westwards to a point to be selected on the old frontier at the salient near Descani[10] Kladenac, a line to be fixed on the ground following the crest of the Ruj Planina and passing through points 1199, 1466, and 1706;

thence southwestwards to point 1516 (Golema Rudina) about 17 kilometers west of Trn, the old Serb-Bulgarian frontier;

thence southwards to a point to be selected on the river Jerma (Trnska) east of Strezimirovci, a line to be fixed on the ground;

thence southwards to the river Dragovishtitsa[11] immediately below the confluence of rivers near point 672, a line to be fixed on the ground passing west of Dzincovci,[12] through points 1112 and 1329, following the watershed between the basins of the rivers Bozicka[13] and Meljanska and passing through points 1731, 1671, 1730, and 1058;

thence southwestwards to the old Serb-Bulgarian frontier at point 1333, about 10 kilometers northwest of the point where the road from Kriva-Palanka to Kyustendil cuts this frontier, a line to be fixed on the ground following the watershed between the Dragovishtitsa on the northwest and the Lomnica and Sovolstica[14] on the southeast;

thence southeastwards to point 1445 on the Males[15] Planina southwest of Dobrilaka, the old Serb-Bulgarian frontier;

thence south-southwestwards to Tumba (point 1253) on the Belashitza[16] Planina, the point of junction of the three frontiers of Greece, Bulgaria, and the Serb-Croat-

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[2] Topolovica in Croat transliteration; thus on the 1:200,000 map.

[3] Croat: Berkovica. [4] Vidlič. [5] Komstica. [6] Croat: Caribrod.

[7] Mözgos. [8] Visan. [9] Vrabca. [10] Descani. [11] Croat: Dragovistica.

[12] Dzincovci. [13] Bozicka. [14] Sovolstica. [15] Males. [16] Croat: Belasitca.

Slovene State, a line to be fixed on the ground passing through point 1600 on the Ograjden[17] Planina, passing east of Stinek and Badilen, west of Bajkovo, cutting the Strumitsa[18] about 3 kilometers east of point 177, and passing east of Gabrinovo.

2. *With Greece:*

From the point defined above eastwards to the point where it leaves the watershed between the basins of the Mesta-Karasu on the south and the Marica[19] on the north near point 1587 (Dibikli), the frontier of 1913 between Bulgaria and Greece.

3. *On the South, with territories which shall be subsequently attributed by the Principal Allied and Associated Powers:*

thence eastwards to the point 1295 situated about 18 kilometers west of Kuchuk[20]-Derbend, a line to be fixed on the ground following the watershed between the basin of the Maritsa on the north, and the basins of the Mesta-Karasu and the other rivers which flow directly into the Egean Sea on the south;

thence eastwards to a point to be chosen on the frontier of 1913 between Bulgaria and Turkey about 4 kilometers north of Kuchuk-Derbend, a line to be fixed on the ground following as nearly as possible the crest line forming the southern limit of the basin of the Archebisar (Dzuma) Suju;[21]

thence northwards to the point where it meets the river Maritsa, the frontier of 1913;

thence to a point to be chosen about 3 kilometers below the railway station of Hadi-K (Kadikoj)[22] the principal course of the Maritsa downstream;

thence northwards to a point to be chosen on the apex of the salient formed by the frontier of the Treaty of Sofia, 1915, about 10 kilometers east-southeast of Jisr Mustafa Pasha, a line to be fixed on the ground;

thence eastwards to the Black Sea, the frontier of the Treaty of Sofia, 1915, then the frontier of 1913.

4. *The Black Sea.*

5. *With Rumania:*

From the Black Sea to the Danube, the frontier existing on August 1, 1914;

thence to the confluence of the Timok and the Danube, the principal channel of navigation of the Danube upstream.

ARTICLE 28

The frontiers described by the present treaty are traced, for such parts as are defined, on the one in a million map attached to the present treaty. In case of differences between the text and the map, the text will prevail.

The next-to-last paragraph of Section 3 refers to the Treaty of Sofia of 1915. It was by this treaty that Bulgaria gained control of the whole line of railroad along the Maritsa River and advanced her boundary to the outskirts of Adrianople. It was partly as a result of this treaty that Bulgaria entered the war on the side of the Central Empires. Having been signed more than a year after the war began (O. S. August 24, N. S. September 6, 1915), its text was not easily available among the Allied countries. It has recently, however, been published in the British "State Papers," Vol. 109. As its geographical clauses are a necessary element in

[17] Ograzden. [18] Croat: Strumica. [19] Sic: "Maritsa" below. [20] Kŭc[ūk].
[21] Akcehisar (Dzuma) suju. [22] Kadiköj.

the definition of the new boundaries of Bulgaria, they are given herewith translated as reprinted from the original French in the *Geographical Journal* for February, 1920 (pp. 137-138). The names have, in this case, likewise been changed to conform with the Austrian map. It is an interesting feature of this treaty that, in two places, the location of the boundary is defined, not in terms of the terrain itself but by the fortuitous position of the lettering on a map!

Treaty of Sofia, 1915

Article 1

The Ottoman Empire agrees to rectify the present frontier in the following manner:

From Konstantinovo (Tatarköy) the Bulgarian-Turkish frontier is to follow the right bank (*talweg*) of the Tundja [Tundža] River as far as the village [should read manor house] of Čiftlik Kösk; from this point it follows the crest between Fikel and the Tundja to the summit of elevation 130; thence it turns west as a straight line, passing below Hadžiköj and R[uin] Sükün, and reaches the summit of elevation 253; leaving Pašamahle and Üsküdar to Bulgaria, it follows the *talweg* between the crest of Duvandža and that of Üsküdar, leaving Duvandža to Turkey, as far as a point situated 2 kilometers distant from the left bank of the Maritsa. From this point to the letter *č* in the word Karagač the frontier is to be laid out by the Delimitation Commission, according to the principles mentioned in Article 2, from 1½ to 2 kilometers at the most north of the left bank of the Maritsa. From the letter *č* of the word Karagač, a town assigned to Bulgaria, the frontier cuts the highroad Karagač-Adrianople in the middle and continues in a straight line to the letter *š* of the word Demirdeš; thence it crosses the Maritsa again and reaches the left bank of the river. From this point the frontier is to follow the left bank of the river at a maximum distance of 2 kilometers east of the left bank until it reaches the sea. It will be laid down by the Delimitation Commission according to the principles mentioned in Article 2.

The map of the Austrian General Staff in 1:200,000 is to serve as the underlying map.

Article 2 (in part)

The Delimitation Commission . . . . . will be guided in its work by the topographic and economic conditions of the terrain and will lay down the frontier from the letters *š* in the word Demirdeš to the mouth of the Maritsa at a maximum distance of 2 kilometers east of the left bank of the river, leaving the city of Enos to Turkey. . . . .

Area and Population

While Bulgaria thus loses considerable territory as a result of the world war, yet her new area does not compare unfavorably with the area she has occupied continuously for a longer period than any other, i. e. her extent from 1886 to 1913, an interval of 27 years of her 42 years of existence. This is evident from a glance at the accompanying series of "silhouette" maps (Fig. 2), which illustrates the territorial development

of Bulgaria by critical dates. The legend of each map indicates the territory gained or lost since the date represented by the preceding map. The boundaries of these pieces of territory can be followed in greater detail on Figure 1, where they are shown by dotted lines, with the year of their establishment.

In the following table the attempt has been made to give the area and population of Bulgaria at each stage of its development, based on a critical selection of figures from the standard references cited as footnotes thereto.

AREA AND POPULATION OF BULGARIA AT PERIODS OF TERRITORIAL CHANGE

	1878	1885	1886	1913	1915	1919
Area in sq. kilometers	63,160*	99,061‡	96,346‖	114,017**	116,642‡‡	105,522‖‖
Approximate Population	1,990,000†	3,100,000§	3,030,000¶	4,712,000††	4,900,000§§	4,300,000¶¶

Abbreviation: BdE=Bevölkerung der Erde, a critical compilation of the population of the countries of the world, each constituting a number of the *Ergänzungshefte zu Petermanns Mitteilungen*, as follows: VI, 1880, No. 62; VII, 1882, No. 69; VIII, 1891, No. 101; XIII, 1909, No. 163.

* Figure based on a planimetric measurement in 1880 by B. Trognitz of the Almanach de Gotha and accepted as standard in its subsequent issues. See BdE VIII, pp. 32 and 44.

† Based on: Population of Bulgaria proper (1873) according to V. Jaksic, 1,965,474; according to census of 1881, 2,007,919. See BdE VI, p. 22, and BdE VIII, p. 44.

‡ Compounded of two possibly not strictly co-ordinate figures: 63,160 for Bulgaria proper (see asterisk footnote above), and 35,901 for Eastern Rumelia, including the Kirdjali and Rhodope districts, based on an earlier planimetric measurement by Trognitz (in which the corresponding value for Bulgaria proper was 63,972). See BdE VII, p. 17, and BdE VIII, pp. 32 and 44.

§ Based on: Population of Bulgaria proper (census of 1881) 2,007,919; of Eastern Rumelia (census of 1880) 815,946; total (1880-81) 2,823,865. Population of Bulgaria proper (census of 1888) 2,193,434; of Eastern Rumelia, 960,941; total (1888) 3,154,375. For figures see BdE VIII, p. 44.

‖ Official figures of Bulgarian census of 1900, quoted in BdE XIII, p. 123.

¶ Based on population of Bulgaria proper as estimated above for 1885, less population of Rhodope (19,326) and Kirdjali (28,721) districts—total 48,047—with allowance for natural increase during one year. See BdE VIII, p. 44, footnote 3 on Bulgaria.

** Almanach de Gotha, 1916, p. 708. The figures on which this is based, viz. 1910 area of Bulgaria (96,345), plus territory acquired from Turkey (25,257), minus loss to Rumania (7525) would give 114,077, however.

†† 4,711,918, Almanach de Gotha, 1916, p. 708, made up of 1910 census population of Bulgaria (4,337,513), plus population of territory acquired from Turkey (656,535), minus population of territory ceded to Rumania (282,131). Natural increase assumed offset by the Balkan wars.

‡‡ Based on measurement at the American Geographical Society from plot on millimeter cross-section paper, in 1:1,000,000, of area acquired in 1915 (result: 2625).

§§ Estimated population of 1913, plus 150,000 for area acquired in 1915, plus 50,000 for natural increase 1913-15.

‖‖ 1913 area (114,017), minus areas by which it is reduced (Timok district, 170; Tsaribrod district, 566; Bosilegrad district, 828; Strumitsa district, 926; "Dibikli exclave," 242; Aegean access, 6136), plus area retained from 1915 (373), as shown on the map accompanying the peace treaty (the boundaries of the area acquired in 1915 are not shown on this map). The seven areas involved were likewise plotted in 1:1,000,000 on millimeter cross-section paper, with the result given in the above figures.

¶¶ Estimated population of 1915, less assumed losses in Aegean corridor (200,000), area acquired in 1915 (150,000), Timok, Tsaribrod, Bosilegrad, Strumitsa districts (200,000), plus assumed excess of natural increase over war losses, 1915-19 (50,000).

THE OPEN PORTS OF CHINA

By E. T. WILLIAMS
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The residence of foreigners in China, excepting that of missionaries, who may live where they please, is restricted to certain cities and towns known as "open ports." Formerly none but seaports were open to such residence; but at present a large number of inland cities are included which only by courtesy can be called "ports," much as one of our own interior cities, Columbus, Ohio, for instance, is for customs purposes a port of entry into the United States.

History of the Opening of Chinese Cities to Foreign Trade and Residence

China's earliest commerce appears to have been an overland trade with the countries of central and western Asia.[1] It does not appear to have been hampered by any restrictions as to the coming and going of foreign travelers or merchants. They seem to have been allowed to reside where they pleased, but their numbers were very few.

Early Method of Control of Aliens

This overland trade was supplemented before the third century of the Christian era by a considerable amount of sea-borne commerce which was conducted through the ports of what is now known as Indo-China; but by 300 A. D. Canton had become the port chiefly interested in this trade and already had a colony of Indians, Persians, and Arabs.[2] For some centuries thereafter foreign vessels appear to have been restricted by custom if not by law to the use of this one port, and the foreigners who came there to live were segregated by the local authorities and placed under the supervision of a headman chosen from among their own number. This practice has led some writers to think that China recognized the right of foreigners to extra-territoriality, but this is a mistake; China never consented to the exercise of extraterritorial jurisdiction by foreign states until forced to do so by defeat in war, when the treaty of 1842 with Great Britain was signed.

The headman appointed to preserve order among the foreign residents

[1] E. H. Parker: China: Her History, Diplomacy, and Commerce from the Earliest Times to the Present Day. New York, 1901. pp. 46-50.

[2] Chau Ju-kua: His Work on the Chinese and Arab Trade in the Twelfth and Thirteenth Centuries, entitled Chu-fan-chï. Transl. from the Chinese and annotated by F. Hirth and W. W. Rockhill. St. Petersburg, 1911. p. 4 *et seqq.*

of Canton was not a representative of any foreign government nor chosen by any foreign official; he represented the Chinese officials and assisted them in enforcing upon the foreign residents the observance of Chinese laws and ordinances. It is interesting to note, however, that he was permitted in the case of minor offences to substitute, according to a fixed scale of equivalents, so many strokes of the rattan for those of the bamboo prescribed by the Chinese code, because the foreigner was accustomed to the use of the rattan.[3]

This custom of controlling aliens through their own representatives was employed by the Spaniards for the government of the Chinese in the Philippines[4] and by the Dutch for the administration of the law among the Chinese in Java.[5] It appears also to have been the method employed by the ancient Romans for the control of certain foreign colonies in the empire, such as those of the Jews in Alexandria and elsewhere.[6]

Arab Monopoly of Chinese Trade in the Middle Ages

By the eighth century of the Christian era the foreign trade of Canton seems to have been almost entirely monopolized by the Arabs, and for eight hundred years they retained this control. They were good Mohammedans and assembled themselves on Fridays for worship in the mosque which they had established in the foreign quarter of Canton.[7] A tomb, alleged to be that of a maternal uncle of the Prophet, is still shown to visitors there.[8] This long and unbroken intercourse between Arabia and China left its effect upon both peoples. The familiar story of Aladdin and his wonderful lamp in the "Arabian Nights" was that of a Chinese boy.

As early as the ninth century of our era this trade of the Arabs spread to Chüanchow, near the modern port of Amoy, and at about the same time to Mingchow (now Ningpo) and Hangchow.[9] On the Chinese side this foreign commerce was a government monopoly and had become so valuable by the tenth century that an official mission was sent abroad to investigate and report methods for its encouragement.[10] In the twelfth century there appears to have been a reaction, for we find the trade restricted to Canton and Chüanchow.[11] By the thirteenth century the Mongols were in possession of China and had established peace through the greater part of Asia. They encouraged foreign intercourse and trade and appointed commission-

[3] Chau Ju-Kua, pp. 16-17.

[4] F. H. Sawyer: The Inhabitants of the Philippines, New York, 1900, p. 291.

[5] T. S. Raffles: The History of Java, 2 vols., London, 1817; reference in Vol. 1, p. 75.

[6] Emil Schürer: History of the Jewish People in the Time of Jesus Christ, Engl. transl., 5 vols., Edinburgh, 1886-90; reference in Division II, Vol. 2, pp. 244 and 263.

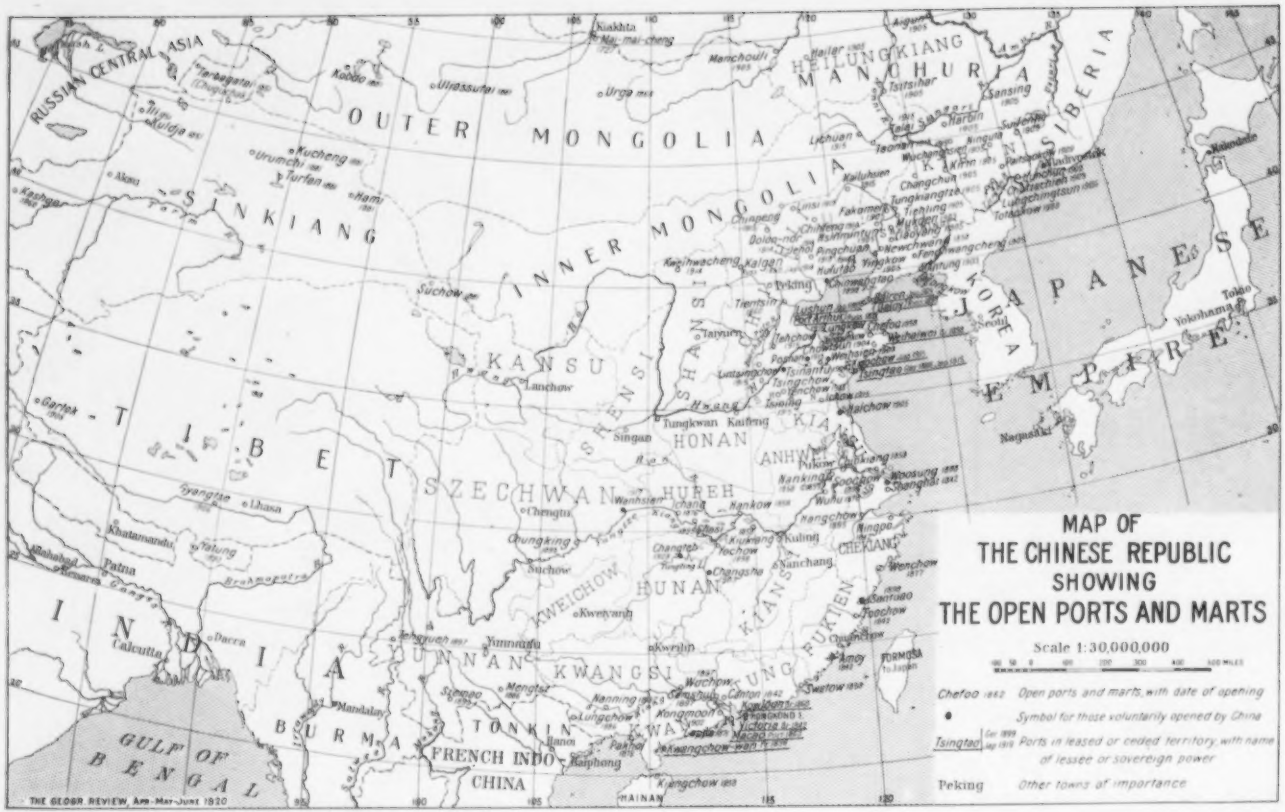
[7] Chau Ju-kua, pp. 15 and 16.

[8] S. W. Williams: The Middle Kingdom, revised edit., 2 vols., New York, 1883; reference in Vol. 2, p. 269.

[9] Chau Ju-kua, pp. 17 and 20.

[10] *Ibid.*, p. 19.

[11] *Ibid.*, p. 22.


MAP OF
THE CHINESE REPUBLIC
SHOWING
THE OPEN PORTS AND MARTS
Scale 1:30,000,000
Chefoo 1862 Open ports and marts, with date of opening
Symbol for those voluntarily opened by China
Tsingtao Ger. 1899 Jap. 1915 Ports in leased or ceded territory, with name of lessee or sovereign power
Peking Other towns of importance
RUSSIAN CENTRAL ASIA
OUTER MONGOLIA
INNER MONGOLIA
HEILUNGKIANG
MANCHURIA
SIBERIA
SINKIANG
KANSU
TIBET
SZECHWAN
SHENSI
HONAN
HUPEH
ANHWEI
KIANGSU
CHEKIANG
KIANGSI
FUKIEN
HUNAN
KWEICHOW
YUNNAN
KWANGSI
KWANGTUNG
JAPANESE EMPIRE
KOREA
FORMOSA
INDIA
BURMA
FRENCH INDO-CHINA
TONKIN
GULF OF BENGAL
HAINAN
Kobdo
Urga
Kiakhta
Kalgan
Peking
Tientsin
Tsinanfu
Tsingtao
Nanking
Shanghai
Hankow
Changsha
Kiukiang
Foochow
Amoy
Swatow
Canton
Wuchow
Kongmoon
Hongkong
Kwangchow-wan
Lanchow
Chengtu
Suchow
Yunnanfu
Mengtsz
Lungchow
Haiphong
Hanoi
Kweiyang
Ichang
Wanhsien
Changteh
Yochow
Kiukiang
Nanchang
Wenchow
Ningpo
Hangchow
Chinkiang
Soochow
Nanking
Yokohama
Tokio
Nagasaki
Mukden
Harbin
Tsitsihar
Aigun
Urumchi
Kucheng
Turfan
Hami
Kashgar
Yarkand
Khotan
Gartok
Lhasa
Tsangpo
Brahmaputra
Patna
Calcutta
Darjeeling
Mandalay
Bhamo
Myitkyina
Kiaochow
Weihaiwei
Port Arthur
Dairen
Newchwang
Antung
Fengwangcheng
Changchun
Kirin
Vladivostok
Nikolaevsk
Sakhalin

ers of maritime shipping at Shanghai, Hangchow, Ningpo, Wenchow, Chüanchow, and Canton.[12]

As early as the fifth century of our era the bay of Kiaochow, whose possession is now the subject of dispute between China and Japan, was mentioned by the monk Fa-hien as the place near which he landed on his return from India,[13] but his vessel had been driven out of its course by a typhoon and quite unintentionally reached the coast of Shantung. There is some reason to believe that this bay may have been used by foreign vessels in very early times; but the evidence is not conclusive, and, generally speaking, the inhabitants of the coast provinces north of the Yangtze River took but little interest in foreign trade until after the second war with Great Britain (1860).

Portuguese Trade and the Opening of Macao

When the Portuguese rounded the Cape of Good Hope in 1498 and made their way to India the Arab-Venetian trade over the Isthmus of Suez began to decline. In vain the Arabs endeavored to keep the Portuguese out of Canton; the monopoly of China's foreign trade was lost by them and passed for a time to Portugal. Following the example of the Arabs, the Portuguese extended their trade to Ningpo, Chüanchow, and Foochow, but the conduct of the foreign merchants was so scandalous that in 1545 the Emperor of China ordered them to be attacked wherever found. A massacre occurred in Ningpo which resulted in the death of 12,000 people, of whom 800 were Portuguese, and in the burning of 35 ships and two junks. A similar massacre took place in Chüanchow in 1549.[14] This forced the Portuguese to seek refuge on the island of Lampaco, where they had had a settlement for some years. All other ports were closed against them until 1557, when they persuaded the Chinese authorities to permit them to erect sheds for storing cargo at Macao, where in previous years foreigners had at times been allowed temporary shelter. Gradually thereafter Macao became the place of residence for all foreign merchants in China. In 1757 an Imperial Edict restricted all foreign trade to Canton,[15] but after the season closed the merchants were compelled to leave Canton and return to Macao, where, as their numbers grew, they were in after years required to leave their families the year round. The Portuguese leased Macao and in recognition of Chinese sovereignty paid an annual rent until 1849. After that date they refused to pay any rent and claimed the sovereignty of the

[12] Sir Henry Yule, transl. and edit.: The Book of Ser Marco Polo the Venetian Concerning the Kingdoms and Marvels of the East, 3rd edit., revised by H. Cordier, 2 vols., London, 1903; reference in Vol. 2, p. 238.

[13] See "A Record of Buddhistic Kingdoms: Being an Account by the Chinese Monk Fâ-hien of His Travels in India and Ceylon (A. D. 399-414) in Search of the Buddhist Books of Discipline," transl. by J. Legge, Oxford, 1886, p. 114.

[14] H. B. Morse: The International Relations of the Chinese Empire, 3 vols., London, 1910-18; reference in Vol. 1, p. 42.

[15] *Ibid.*, Vol. 1, p. 67.

place—a claim which the Chinese would not admit until 1887.[16] Macao lies at the end of a very small peninsula at the west side of the entrance to the Canton estuary. It is still a Portuguese possession, but for several decades has had a very unsavory reputation and has altogether ceased to have any commercial importance.

The British East India Company at Canton

During the eighteenth century the foreign trade of China was very largely in the hands of the British East India Company, which had a monopoly of the British share in it. Various attempts were made by the company to extend its trade to other ports than Canton, but without success. The Co-Hong at Canton, which monopolized the trade from the Chinese side, opposed such attempts with all its influence, and that was too great to be overcome. The British East India Company was dissolved in 1834, but the Chinese Co-Hong continued to enjoy its special privileges, for which the Chinese Government exacted a good share of the profits. To meet these demands the Co-Hong had to squeeze the foreign merchants. Through the Co-Hong, too, the Chinese officials imposed upon the foreigner many irksome regulations. Complaints of excessive charges and annoying restrictions were among the chief causes of the first war (1840-1842) between Great Britain and China. That war resulted in the Treaty of Nanking, by which the Co-Hong was abolished, all monopolies were forbidden, and five ports instead of one opened to the residence and trade of foreigners.

The Cession of Hongkong to Great Britain

These five ports were Canton, Amoy, Foochow, Ningpo, and Shanghai, the same ports which for more than seven hundred years had at various times participated in the trade—the port of Amoy being for all practical purposes identical with Chüanchow, a few miles distant. By the same treaty the island of Hongkong, lying just outside the mouth of the Canton estuary, was ceded to Great Britain.

The establishment of a free port at Victoria on the island of Hongkong under the protection of Great Britain, where merchants were no longer annoyed by the heavy exactions and petty restrictions of the Canton officials, soon deprived the latter city of its prestige. The great business houses made their headquarters at Hongkong, and in the safe and spacious harbor of Victoria the vessels of all nations gathered to load and unload their cargoes.

Hongkong is a British crown colony, and, strictly speaking, its chief city, Victoria, cannot be classed with the open ports of China. But the trade which centers there is substantially a trade between China and foreign

[16] Morse, International Relations, etc., Vol. I, p. 43.

countries. The port is a place of shipment abroad of Chinese wares and a landing place for imports into China. The local consumption of Chinese and foreign goods is a negligible quantity compared with the volume which passes through the port. There are no statistics of this trade, but it is estimated to be about one-half that of Shanghai. There is, however, a record of the shipping, the tonnage of which in 1906 amounted to 8,812,827 tons for vessels to and from foreign ports and 13,640,250 tons for coastwise shipping, a total of 22,453,077 tons, making it one of the largest ports in the world in amount of shipping.[17]

The colony was enlarged in 1860 after the second war with Great Britain by the cession of Kowloon on the mainland opposite Victoria. This made the whole area of the colony 29 square miles. A further addition was made in 1898 by the lease for 99 years of the hinterland of Kowloon and the waters of several bays and by the inclusion of a number of islands along the coast, making the whole area 1,031 square miles instead of 29. About one-half of the addition is water. The land area was increased nearly fifteen-fold.

In 1907 a contract was signed for the construction of a railway from Kowloon to Canton. This work is now completed.

Chinese Overland Trade with Russia

The foreign trade of China, however, is not confined to that which is carried on by sea; from ancient times there has been an important exchange of commodities over the land frontiers. The overland traffic which once added to the luxury of Antioch and the wealth of Constantinople ceased long ago, but Moscow fell heir to it, as is witnessed by the existence there of the Kitai Gorod, the quarter of the city where that trade was conducted. The first treaty[18] which China ever signed with a European state, that of 1689 with Russia, provided that the subjects of either power might cross the frontier for purposes of trade. That of 1727 permitted a Russian caravan of not more than two hundred merchants to visit Peking once every three years and, during the interval between the triennial visits to Peking, allowed an exchange of commodities only (no silver to be used) at two places on the frontier.[19] One of these, Mai-mai-cheng, is still a mart of some importance. It is just across the boundary from the Russian city of Kiakhta.

Trade at Kuldja, at Ili, and at Tarbagatai, in the extreme western part of Mongolia, began as early as 1847 without a treaty but was regularized

[17] Morse, International Relations, etc., Vol. 2, p. 396.

[18] For the text of all the treaties mentioned in this article see: Treaties, etc., between Great Britain and China, and between China and Foreign Powers, and Orders in Council, etc., affecting British Interests in China, 3rd edit., revised by G. G. P. Hertslet and E. Parkes, 2 vols., London, 1908.—Edit. Note.

[19] Morse, International Relations, etc., Vol. 1, p. 473.

by the treaty of 1851. Article V of the treaty of 1860 with Russia permitted trade at Urga, the capital of Outer Mongolia, and at Kalgan, 135 miles north of Peking, at one of the passes through the Great Wall. The same treaty permitted caravans to visit Peking as often as they liked, provided not more than two hundred merchants were in any one caravan. This treaty also opened Kashgar, in the western part of Chinese Turkestan. The treaty of 1869 permitted merchants to proceed for purposes of trade to all parts of Mongolia where Chinese officers were residing; and that of 1881 agreed to the appointment of Russian consuls to Kobdo and Uliassutai in western Mongolia, to Hami in eastern Turkestan south of the Tien Shan, to Urumchi and Kucheng in Zungaria, as well as to Turfan in the region of that name, and Suchow in the extreme northwestern corner of the province of Kansu. Turfan, however, it was expressly stated, was not open to the residence of foreign merchants.

Ports Opened After the Second War with Great Britain

After the second war with Great Britain (1860), in which France participated, eleven more ports in China were opened, four on the great Yangtze River and seven on or near the seacoast. The former were Hankow, Kiukiang, Nanking, and Chinkiang; the latter were Newchwang in Manchuria, Tientsin, the gateway to the capital, Chefoo in Shantung, Swatow at the eastern extremity of Kwangtung province, of which Canton is the capital, Kiungchow in the island of Hainan, and two ports in Formosa now in the possession of Japan. Nanking, being in the possession of the Taiping rebels, was not opened; its opening did not take place until 1899.

On February 21, 1875, Augustus R. Margary, a British consular officer, was murdered in the province of Yunnan, on the southwestern frontier of China, out of which unfortunate incident came the British treaty of 1876. This provided for the opening of four more cities: Ichang and Wuhu on the Yangtze, Wenchow on the eastern coast, and Pakhoi on the southern.

After the war of 1884 between France and China which led to the annexation of Tonkin to Indo-China, pressure was brought to bear to force the opening of three ports on the southwestern frontier: Lungchow in Kwangsi, Mengtsz and Szemao in Yunnan.

The delimitation of the boundary between British India and Tibet by the convention of December 5, 1893, was made an occasion for asking for the opening of Yatung in Tibet as a trade mart. The following year, on March 1, another convention was signed delimiting the boundary between Burma and China and providing for an open town on that frontier. The town chosen was Tengyueh in Yunnan.

During that year China was at war with Japan. The treaty of Shimo-

noseki opened four interior cities to foreign residence and trade: two on the Yangtze, Chungking and Shasi; and two on the Grand Canal, Hangchow and Soochow.

On February 4, 1897, the frontier of Yunnan and Burma was rectified so as to give additional areas to Burma, and three cities on the Sikiang, or West River, were opened: Wuchow in Kwangsi, Shamshui and Kongmoon in Kwangtung.

Seizure of Kiaochow Bay by the Germans

The treaty of Shimonoseki of 1895 between China and Japan had ceded to the latter the southern part of Manchuria. To this Russia, who had fixed her eyes on Manchuria, decidedly objected, advising Japan for the sake of the peace of the Far East to return the territory to China. France and Germany supported Russia in this protest. The very next year Russia demanded and obtained from China by way of compensation for her good offices the right to construct a railway, the Chinese Eastern, across northern Manchuria. There is reason to believe that she also contemplated the lease of Kiaochow Bay. Her fleet wintered there in 1896-1897. But Germany also wanted compensation and in the summer of 1897 examined the coast of China with a view to leasing a port for a naval station. Unfortunately for China, in November, 1897, a band of outlaws attacked and looted a village in southwestern Shantung. Several persons were killed, among them two German missionaries who happened to be spending the night in that village. There was no anti-foreign movement in progress; it was merely by chance that these two Germans were in the village. A German fleet immediately visited Kiaochow Bay, landed a force of bluejackets, and seized the forts. After securing China's assent to the payment of a money compensation and to the dismissal of the governor of the province, Germany also demanded and obtained the lease for 99 years of the waters of Kiaochow Bay, the islands in the bay, and two small pieces of territory—one on either side of the entrance. She also obtained the right to build a railway from the port to the provincial capital together with certain mining rights and other economic privileges in the province of Shantung.[20] The lease included the town of Tsingtao, which has since become a beautiful city. Kiaochow Bay was dredged and is now the finest harbor in China north of the Yangtze.

Leases of Territory to Other European Powers

If Russia was maneuvered out of Kiaochow, she soon obtained an equivalent in the lease of the Kwangtung peninsula of southern Manchuria, with its two harbors, Port Arthur and Dalny, and the right to construct a railway from these ports to Harbin on the Chinese Eastern Railway.[21]

[20] W. W. Rockhill: Treaties and Conventions With or Concerning China and Korea, 1894-1904, Washington, D. C., 1904, p. 45.

[21] *Ibid.*, p. 50.

Great Britain, jealous of Russia, demanded and obtained the lease of Weihaiwei, on the northern coast of Shantung opposite Port Arthur, as well as an enlargement of her Hongkong colony by the lease of certain neighboring islands and the extension, also by lease, of the territory of Kowloon on the mainland.[22] France also asked and was granted compensation in a lease of the bay of Kwangchow-wan,[23] with adjoining territory. These leases were all granted in 1898.

In January of that same year the British Government had offered to make to China directly and officially a loan of £12,000,000 to enable the latter to pay the balance of the indemnity due Japan for the retrocession of southern Manchuria. Russia and France objected strongly to a loan by a single power, and in the end the government loan had to be abandoned. China then negotiated for a larger loan from the Hongkong and Shanghai Banking Corporation in conjunction with the Deutsch-Asiatische Bank.[24] The rejection by China of a loan from the British Government, which had once been accepted, was an affront for which Great Britain demanded compensation. A part of this compensation was a promise by China to open the city of Nanning in Kwangsi and a port in Hunan, which was afterwards decided to be Yochow on the Yangtze at the entrance to Tungting Lake.[25]

China's Voluntary Opening of Certain Ports

The demand by European powers for leases of territory in various parts of China and the international scramble for loans and railway concessions led to talk of the partition of China and aroused a very bitter feeling in the breasts of the Chinese people. It was the immediate cause also of the proposal by Secretary of State Hay of the policy of the "open door" and the direct incitement to the anti-foreign movement, miscalled the "Boxer" rising. Another result of importance was the adoption by the Chinese Government of a policy of voluntarily opening desirable ports so that they might remain under Chinese control. In accordance with this policy three ports were opened by China in 1898: Chinwangtao, the winter port of Tientsin; Woosung, at the mouth of the Whangpoo, where it enters the Yangtze; and Santuao, in Fukien. Subsequently other cities were opened on the same basis, five of them in all: Tsinan, the capital of Shantung, with Weihsien and Chowtsun in the same province as subordinate to the Tsinan customs, in 1904; Haichow, on the coast of northern Kiangsu, in 1905; and Changteh, in the province of Hunan, in 1908.

Opening of Ports After the Russo-Japanese War

It was in the year 1904 that war broke out between Russia and Japan,

[22] *Ibid.*, p. 58 and 60.
[23] *Ibid.*, p. 55.
[24] Morse, International Relations, etc., Vol. 3, pp. 114-117.
[25] *Ibid.*, Vol. 3, p. 124.

fought almost wholly on Chinese territory. In anticipation of this the United States Government in its commercial treaty of 1903 secured the opening of Mukden and Antung in Manchuria. At the same time Japan in a similar treaty asked for the opening of Tatungkow at the mouth of the Yalu in Manchuria. After the treaty of peace with Russia had been signed in 1905 Japan by convention with China obtained a recognition of the former's succession to Russian rights in southern Manchuria and persuaded China to open 18 more places in northern and southern Manchuria: Manchouli, Hailar, Tsitsihar, Aigun, Sansing, Suifenho, Harbin, Hunchun, Lungchingtsun, Ninguta, Kirin, Changchun, Fakumen, Tungkiangtze, Tiehling, Hsinmintun, Liaoyang, Fenghwangcheng.

While Russia was busily engaged in the war with Japan Great Britain sent Younghusband to Lhasa and won thereby a privileged position in Tibet. The convention signed in 1904 was, with some modifications, ratified by China in 1906. In accordance with its stipulations two more towns were opened in Tibet: Gyangtse and Gartok.

In 1909 Japan and China had a misunderstanding concerning the status of certain Korean settlers in the Chientao region of eastern Manchuria. After some negotiation the matter was adjusted, and three more towns in that part of Manchuria were opened: Chützechieh, Totaokow, and Paitsaokow.

In 1914 China was further persuaded by Japan to open the new port being constructed at the head of the Gulf of Chihli, Hulutao, and five places in the province of Chihli: Chihfeng, Dolon-nor, Kweihwacheng, Jehol, and Kalgan. The last-mentioned had long been open to Russians.

Among the "Twenty-one Demands" made upon China in 1915 by her neighbor were those for the opening of additional towns in Shantung and in eastern Inner Mongolia. Ten were selected in Shantung: Kiaochow, Lungkow, Tsingtao, Tehchow, Lintsingchow, Yangkiokow, Tsining, Yenchow, Ichow, and Poshan. Eight were added for eastern Inner Mongolia: Lichüan, Kailuhsien, Hsiao Kulun, Linsi, Talai, Chinpeng, Pingchüan, and Wuchanghsien.

The opening of Wanhsien in Szechwan was provisionally granted in the British treaty of 1902, but the stipulations were not fulfilled and the right lapsed. Subsequently in 1917 the Chinese government opened the place upon its own initiative.

Thus there are not less than 107 cities and towns of China open to foreign residence and trade.

Survey of Foreign Trade of the Various Provinces and Cities

Canton and Its Tributary Provinces, Kwangtung and Kwangsi

Canton,[26] which for so many centuries held a monopoly of the foreign

[26] Population, 1917, 900,000; whole trade, Tls. 102,844,940; direct foreign trade, Tls. 77,868,466. The Haikwan tael in 1907 was worth U. S. $1.03. Trade statistics here and elsewhere in this article refer only to the trade passing through the Maritime Customs.

trade, has yielded the scepter to Shanghai. Nevertheless, it must always continue to be a port of importance, since it is the heart of the great delta formed by the junction of the North, West, and East Rivers. It has a population of a million in round numbers and is the metropolis of Southern China. By the waterways of Kwangtung and Kwangsi it gathers to itself the greater part of the trade of the two provinces. Kowloon, opposite Hongkong, Lappa, the customs station of Macao, Samshui and Kongmoon in the delta, Wuchow on the West River, and Nanning and Lungchow, on the upper waters of that river, are all tributary to Canton. Nanning has recently taken the place of Kweilin as the capital of Kwangsi. Lungchow was opened because it was expected that the railway from Hanoi to Langson in French Indo-China would be extended to that city. This has not yet been done. Although the place is near the frontier, it is separated from Langson by lofty ranges of mountains. The city lies in the midst of magnificent scenery, but the broken character of the country, which contributes so much to its picturesqueness, discourages railway building. Roads suitable for motor cars, however, are under construction. The trade of Lungchow is negligible in quantity. The old factory sites of Canton were long ago abandoned. Since 1859 the foreign settlement has been located in two concessions, one British, the other French, on the island of Shameen.

Except in the Canton delta the two provinces, Kwangtung and Kwangsi, are for the most part very mountainous. Kwangsi is wild and sparsely inhabited. It is notorious for the disorderly character of its inhabitants, who are much given to brigandage. Two-thirds of them are but semi-civilized and belong to non-Chinese races: the Miao and the Shan. Kwangtung, on the other hand, is rather densely populated. A recent census[27] gives over 31,000,000, an average of 318 to the square mile. Over half of these are pure Chinese. Other races are represented, such as the Miao, the Yao, and the Tung-Chia, or cave dwellers. Both provinces lie partly within the tropics, but except in the narrow valleys of southern Kwangsi, where the heat is enervating, the climate is tempered by the cool, dry winds of winter. The Cantonese, therefore, are a hardy, enterprising people. The mineral resources of the two provinces are believed to be considerable but are very little developed. The agricultural products are varied. Sugar cane, rice, cotton, tobacco, and tea are among the most important. Silk and grass cloth are produced in considerable quantities, and these, together with matting, fans, cassia, and tea, are among the principal exports shipped from Canton.

Other Ports of Kwantung Province

Pakhoi, in the southwestern part of Kwangtung at the head of the Gulf of Tonkin, serves the portions of the two provinces that are not within easy

[27] L. Richard: Comprehensive Geography of the Chinese Empire and Its Dependencies, transl. by M. Kennelly, Shanghai, 1908, p. 202.

communication with Canton. Aniseed, aniseed oil, tin, and indigo are among its exports.

The island of Hainan is also a part of Kwangtung Province. Its one open port, Kiungchow,[28] trades chiefly with Hongkong. Its principal exports are sugar, pigs, poultry, and betel nuts. The island is mountainous and is occupied in the interior almost wholly by the aborigines, the Li, believed to be related to the Siamese.[29] About two millions of Chinese are in possession of the coast. The fauna and flora of the island are tropical in the main but not wholly so. There are large deer to be found there and also monkeys and venomous snakes. Coconuts, palms, and pineapples are abundant.[30]

Kwangchow-wan, the port leased to France, is also in Kwangtung Province. It has a good harbor, but the entrance to the bay is difficult. The French Government, it appears, has done nothing to improve the port or develop the region to which it gives access; but French occupation of the port prevents its use by any one else who might make it a rival to Haiphong,[31] the chief port of French Indo-China.

Swatow,[32] in the eastern part of Kwangtung Province, serves a limited district in the valley of the Han River. A railway connects the port with the city of Chaochow, 30 miles distant. Its trade is of considerable value. The chief exports are tobacco and sugar. Large quantities of sugar are shipped to Hongkong for refining. The people of Swatow are very enterprising and are found engaged in trade in many parts of China. They are extremely clannish, and the guild[33] of Swatow absolutely controls the town. It is not only a chamber of commerce but a municipal council as well; and, not content with controlling its own port, it maintains direct connection with organizations of Swatow men in other cities and uses its influence to protect and promote the interests of fellow townsmen wherever they may be.

Fukien Province

Fukien, the province opposite the island of Formosa, has three open ports: Amoy,[34] Foochow,[35] and Santuao.[36] The province is one of the smallest but is densely peopled. With an area of 46,332 squares miles it claims a population of over 22,000,000. This density of population in a mountainous region compels emigration. It is estimated that as many as

[28] Population, 35,000; its port, Hoihow, adds 25,000; whole trade, 1917, Tls. 5,917,094.

[29] P. G. von Möllendorff: Foreign Languages Spoken in China, *China Mission Handbook*, 1896, p. 49.

[30] Richard: Comprehensive Geography of the Chinese Empire, p. 206.

[31] H. B. Morse: The Trade and Administration of China, revised edit., London, 1913, pp. 268-269; *idem*, International Relations, etc., Vol. 3, p. 113.

[32] Direct foreign trade in 1917, Tls. 23,319,723; whole trade, Tls. 51,900,351.

[33] H. B. Morse: The Gilds of China, London, 1909, pp. 53-57.

[34] Population, 300,000; whole trade in 1917, Tls. 14,602,519; direct foreign trade, Tls. 9,846,297.

[35] Population, 624,000; whole trade reported at customs in 1917, Tls. 15,223,269; direct foreign trade, Tls. 6,747,882.

[36] Population, 8,000; whole trade reported at customs in 1917, Tls. 2,502,562; direct foreign trade, Tls. 27,793.

200,000 men every year leave Amoy for the Philippines, the Straits Settlements, and other parts of the East Indies. The coast is deeply indented and has a number of fine harbors. The people are bold seamen, and many are engaged in fishing. Shut in as they are by the mountains, they preserve a dialect quite different from any other in China. Besides the Chinese, two aboriginal races inhabit the province: the Tung-chia and the Hsük'o. The latter are said to have brown hair.

The mineral resources of the province are believed to be important, but they are undeveloped. Japan claims Fukien to be within her sphere of interest and is unwilling that others should make investments there. Among the agricultural products are tea, rice, oranges, sugar, ginger, and camphor. Silk and paper are manufactured in large quantities, and Foochow in particular is noted for its lacquered ware. Tea is the principal article of export; but the trade has declined, partly owing to the growth of the demand for India teas but also because the opening of other ports on the coast and on the Yangtze has made it possible for the interior provinces to find easier routes to the sea. The mountain ranges are parallel to the coast, and this makes communication with the interior difficult. The ports therefore have not the importance that attached to them in the early days of foreign trade when the porcelains of Kiangsi were carried over the mountains to Marco Polo's Zayton.[37] This has been identified with the present Chüanchow, which once had an excellent harbor, now inaccessible because of sand bars. Amoy is close at hand and takes its place. Zayton, according to some authorities, gave us the word "satin."[38] But the manufacture of silks and satins for which that district was once noted seems to have declined. The foreign settlement at Amoy is on the island of Kulangsu in the harbor. The Japanese have been granted a site on the mainland for a separate settlement.

Foochow is situated on the picturesque Min River about 34 miles from its mouth. It cannot be reached by steamers, which are compelled to anchor nine miles below the city at Pagoda Anchorage, where also are found the arsenal and the government dockyards. Santuao has one of the finest harbors in the world, but it is shut in by mountains and serves a very small district, whose principal product is tea. The place was opened to prevent its being seized by some foreign power. The Chinese Government in 1913 was desirous of establishing a naval base there but met with opposition from Japan.

Chekiang Province

The province of Chekiang, which adjoins that of Fukien on the north, also has three open ports: Wenchow,[39] Ningpo,[40] and Hangchow.[41] The

[37] Yule, Marco Polo, Vol. 2, p. 243.
[38] *Ibid.*, Vol. 2, p. 241.
[39] Population, 124,544; whole trade in 1917, Tls. 3,232,222; direct foreign trade, Tls. 11,846.
[40] Population, 470,000; whole trade in 1917, Tls. 25,107,523; direct foreign trade, Tls 2,707,630.
[41] Population, 684,137; whole trade in 1917, Tls. 21,020,832; direct foreign trade, Tls. 136,546

province is the smallest in China. It contains 36,680 square miles and has between 11,000,000 and 12,000,000 inhabitants. The mountains of Fukien, known as the Tayü Ling, continue into this province and, crossing it from southwest to northeast, terminate in the sea, forming the Chusan Archipelago, opposite Ningpo.[42] The province is thus divided into two nearly equal parts, whose fauna, flora, and population differ considerably. The southern part is mountainous, and its products, as well as the dialects and customs of the people, resemble those of Fukien. Wenchow serves this region. Situated on a river called the Ngo Chiang a few miles from the sea, it is a clean and beautiful port, with numerous canals, which have caused it to be likened to Venice.[43] But it is unimportant commercially. It was once a great tea port, but deterioration in the quality of the tea led to loss of trade.

The northern part of the province slopes into the great alluvial plain, the gift of the Yangtze River, which extends from Hangchow Bay to the northern part of Kiangsu Province and from Chinkiang to the sea. In this northern part of Chekiang we find dialects similar to those of the Yangtze region, and the pursuits of the people are identical with those of Kiangsu—the cultivation of rice and cotton and the production and manufacture of silk.

The principal exports of the province are silks, satins, rice, orange matting, fans, and furniture.

The Cities of Hangchow and Ningpo

Hangchow is the capital of the province and was once the capital of the nation. It is Marco Polo's Kinsay, which was but another way of saying "King-tzu" or "Capital."[44] It is coupled by the Chinese in a well-known proverb with Soochow as forming together the two most beautiful cities in the world.[45] The great city, with its interesting shops, its temples and mosques and pagodas, and its picturesque surroundings, particularly the Western Lake with its pleasure resorts, is an attractive place and before the ravages of the Taipings must have been even more beautiful than now.

It is the southern terminus of the Grand Canal and lies at the head of Hangchow Bay. It can never be a great seaport, however, because of the bore in the bay, which makes navigation too dangerous. The bore is due to three causes: (1) the funnel shape of the bay, 60 miles wide and of great depth at its mouth, narrow and shallow at its head; (2) the large area of sand flats at the head of the bay; and (3) the current of the Tsiengtang

[42] Richard, Comprehensive Geography of the Chinese Empire, p. 228.
[43] Morse, Trade and Administration of China, p. 252.
[44] Yule, Marco Polo, Vol. 2, p. 149.
[45] The proverb, a couplet, has been translated:

"Above is heaven's blue;
Below are Hang and Soo."

River. The incoming tide meets the outgoing current of the river, and, seen at its best, the bore is a wall of water sometimes 19 feet in height traveling at the rate of 15 miles an hour.[46] Because of this obstruction to navigation the seaport of the district is Ningpo, near the mouth of the bay, on the Yung River about 15 miles from the sea.

Ningpo is the Liampo[47] of the sixteenth century and the Mingchou and Ch'ingyüan[48] of earlier times. Although there was a flourishing colony of Portuguese there in the sixteenth century, the reopening of the port in 1843 did not lead to the trade development expected. The British were in possession of the Chusan Archipelago at the entrance to Hangchow Bay from 1841 to 1846. Ningpo had every chance to become the commercial capital of China under such favoring conditions; but its guilds were illiberal in their attitude towards foreign trade, and the prize passed to Shanghai.[49] Today Ningpo is commercially a dependency of Shanghai, with which port daily communication is maintained by coasting steamers. A railway is to connect Ningpo with Hangchow. The latter city is already connected with Shanghai by railway as well as by canal and river.

Kiangsu Province and the Shanghai Region

Kiangsu Province, which embraces most of the delta of the Yangtze, has six open ports: Shanghai, Woosung, Soochow, Chinkiang, Nanking, and Haichow.

Shanghai,[50] the commercial metropolis of China, is situated at the junction of the Hwangpu and Woosung Rivers, the latter now known as Soochow Creek. Some five hundred years ago these two streams were united by a canal which now is regarded as the main channel of the Hwangpu River. The west bank of this canal is the Bund, the principal street of the foreign settlement. From the foreign settlement to the mouth of the river the channel was originally that of the Woosung River, but this too is now considered a portion of the Hwangpu. The stream empties into the mouth of the Yangtze at the town of Woosung, some fourteen miles below Shanghai. The largest ocean-going steamships usually anchor at this point and do not ascend the river to Shanghai without lightering their cargoes. The Protocol of 1901, entered into after the "Boxer" troubles, provided that measures should be taken to improve the channel of the Hwangpu.[51] By the straightening of the channel and by dredging operations navigation has been made much easier. There is now maintained at low water a depth of 24 feet on the inner bar.

[46] Commander Moore: The Bore of the Tsien-tang kiang (Hang-chau Bay), *Journ. North China Branch of the Royal Asiatic Soc.*, Vol. 23, N. S., 1888, pp. 185-247; reference on pp. 216 and 218.

[47] Yule, Marco Polo, Vol. 2, p. 239, note.

[48] Chau Ju-kua, pp. 18 and 20.

[49] Morse, Trade and Administration of China, p. 252.

[50] Population about 1,000,000, of whom 18,519 are foreigners (Japanese 7,169, British 4,822, Americans 1,3[illegible]); foreign trade in 1917, Tls. 497,440,649.

[51] The provisions of the Protocol were amended in 1905, and the work was begun in 1906.

The whole region about Shanghai, from the Grand Canal to the sea and between the Yangtze and Hangchow Bay, is a vast alluvial plain very little elevated above the level of the sea except where here and there a hill, once an island in this great delta of the Yangtze, lifts itself above the plain. This plain is intersected in all directions by numerous canals, which afford easy communication between the numerous cities and towns of the district and facilitate the transport to market of the products of the fertile soil and the manufactures of a skillful and industrious population.[52] A sea wall protects the coast lands in many places. Every foot of ground appears to be utilized. The soil is of inexhaustible fertility. The principal field crops are rice and cotton. Mulberry orchards abound for the feeding of silkworms. The silk produced is of the very finest. The reeling, spinning, dyeing, and weaving of the silk give employment to millions and constitute one of the chief industries of this region. The fertile soil is not the only dependence of the farmer; the waters of the canals, lakes, and rivers are also made to contribute to his wealth. They are stocked with fish which are taken in nets or caught with cormorants, and the less frequented canals are planted with water chestnuts,[53] the lotus, and other aquatic plants.

Shanghai

Shanghai consists of three separate municipalities: the old native city, which dates from 242 B. C. and which, with its narrow ill-smelling streets, was until recently enclosed within its own walls; the French Concession, immediately to the north of the city and formerly separated from it by the moat; and the International Concession north of the French Concession. A few years ago the wall around the native city was removed, and the moat filled up. This made possible the construction of a boulevard around the old town. The French Concession was formerly separated from the International Concession by a creek, the Yangkingpang, which has since been converted into a covered sewer. These are great improvements, contributing much to the sightliness of the city and perhaps to its sanitary betterment, although Shanghai has always enjoyed a good reputation for healthfulness.[54] The three municipalities cover an area of ten or twelve square miles. The foreign settlements are well provided with good water, gas, and electricity; and the macadamized streets and suburban roads are kept in excellent condition. Railways connect the settlements with the port of Woosung and with Hangchow and Nanking. Daily communication is maintained by steamers with the towns on the Yangtze and scarcely less fre-

[52] The Hwangpu, it is estimated, drains 12,000 square miles.

[53] The water chestnut is the *Scirpus tuberosus*. Both the seeds and the root of the lotus are eaten. The latter has been introduced into the United States under the name "tasheen."

[54] Recent statistics give the mortality of Shanghai as 15.4 per thousand. The thermometer ranges from 25° to 103° F. The mean temperature for a period of 8 years was 59.1° F. During the same period the average annual rainfall was 43.46 inches and the average number of rainy days 124.

quently with the ports on the coast. The flags of all maritime nations are seen on the shipping in the river, and a forest of masts along the wharves of the native city mark the landing place of junks from all parts of China.

Other Ports of Kiangsu Province

Soochow,[55] the sister city of Hangchow, is connected with Shanghai both by water and by rail. It is situated on the Grand Canal about 80 miles from Shanghai and close to the shore of the Great Lake. It is noted for its pagodas and for its manufacture of silk.

Chinkiang[56] is at the crossing of the Yangtze and the Grand Canal about 150 miles from the mouth of the great river, of which it is regarded as the gateway. Silver Island and Golden Island with their monasteries add to the beauty of the scenery there. The advantageous location of the port makes it a desirable place for the gathering and distribution of exports and imports.

Nanking[57] is a city of great historic interest, having several times been the capital of the old empire. It was for years the capital, too, of the Taiping rebels and more recently the first meeting place of the republican parliament. The city wall, which varies in height from 50 to 60 feet, encloses a larger area than that of Peking. It has a circuit of 24 miles. The ancient beauty of the place has been much marred by the destruction wrought by the Taipings and by more recent fighting, but the quiet roads that wind about among the grave-clad hills of the northern part of the city disclose many picturesque spots where Buddhist and Taoist abbeys and monasteries are hidden among the bamboo groves. The foreign settlement lies outside the walls, at Hsia-kwan, which is the steamer landing. The Shanghai-Nanking railway has its terminus there and connects by ferry with Pukow across the Yangtze, the southern terminus of the Tientsin-Pukow railway. The trade of Nanking is of no great importance, but its silk factories were once famous. It is today a great educational center and the seat of the provincial administration.

Haichow, as yet, has had no development as a port; but it was selected as the seaward terminal of the trunk line railway for which certain Belgian and French interests hold a contract and which is to connect the far northwest and Turkestan with the sea. The city lies in the northern part of the province near the Shantung boundary. The harbor is a poor one but is sheltered by Pearl Island and with dredging could probably be made suitable, but its proximity to Tsingtao and the proposed connection of that port with the railway just mentioned will likely make unnecessary so

[55] Population, 500,000; whole trade in 1917, Tls. 18,927,756; direct foreign trade, Tls. 24,101.

[56] Population, 168,309; whole trade in 1917, Tls. 18,014,171; direct foreign trade, Tls. 4,865,783.

[57] Population, 377,459; whole trade in 1917, Tls. 22,895,022; direct foreign trade, Tls. 4,360,029. Pukow, on the north shore of the Yangtze, opposite Nanking, is the terminus of the railway from Tientsin and should also be considered as an open port.

costly an undertaking. Shanghai, however, overshadows all other ports in Kiangsu.

Rice, cotton, and silk are among the principal products of the province; and its cotton piece goods, which in other days we knew as nankeen, were among our earliest imports from China. But Shanghai does not merely serve the province of Kiangsu. It is the port of entry and of shipment abroad for a great part of the trade of the whole country. The Yangtze ports in particular are tributary to the commerce of Shanghai.

The Middle Yangtze Valley

The great Yangtze valley is the heart of China, its richest and most populous region. The Yangtze Kiang is formed by four rivers flowing through a province which from that circumstance gets its name, Szechwan (Four Rivers). It is the largest of all the provinces, containing 218,533 square miles, and is bounded on the west by the dependency of Tibet. Its population is variously estimated at from 40,000,000 to 70,000,000.

The chief port of the province is Chungking, situated on a rocky promontory at the confluence of the Kialing (also called "the Little River") with the Yangtze (known there as "the Great River"). It is a rich and busy city[58] with an estimated population of 300,000 to 600,000. The only other city in the province open to foreign residence is Wanhsien, about half-way between Chungking and Ichang.

Ichang, one of the open ports of Hupeh Province, is situated ten miles below the lower entrance to the gorges, about 350 miles down river from Chungking and 370 miles above Hankow; it used to be the head of steam navigation on the Yangtze. Above that port cargoes had to be carried in junks of about 25 tons' capacity. The junks were dragged slowly and painfully up the rapids by human labor. Three weeks was the least amount of time needed for the voyage of 350 miles, and a month was more often consumed. Recently, however, shallow-draft steamers have been built especially for this trade which are able to stem the swift current and which reduce the passage from Ichang to Chungking to days instead of weeks. Ichang[59] is still scarcely more than a port of transshipment. To Americans Ichang is of interest as the eastern terminus of the American section of the Hankow-Szechwan Railway[60] under construction as one of the Hukwang Railway lines. Its population is but 45,000.

A more important commercial mart is Shasi,[61] about 100 miles farther down the river, also in Hupeh Province. Its river front is densely crowded for two or three miles with junks anchored side by side. Behind the port a network of canals and lakes affords communication in many directions

[58] Whole trade, Tls. 83,592,533; direct foreign trade, Tls. 912,764.

[59] Whole trade, Tls. 5,685,589; direct foreign trade, Tls. 246,271.

[60] See the note "A Proposed Railroad to Tap the Red Basin of Szechwan, China," with map, 1:5,700,000 in *Geogr. Rev.*, Vol. 7, 1919, pp. 184-186.—Edit. Note.

[61] Population, 105,000; whole trade, Tls. 4,422,849; direct foreign trade, Tls. 285,215.

through the triangular plain that lies between the Yangtze and the Han River and reaches to Hankow.

Hankow

It is Hankow[62] that is the chief port of the province of Hupeh and indeed the great commercial capital of central China. Hankow has been called the Chicago of China and not inappropriately so. The name means "the mouth of the Han." Lying at the junction of the Han with the Yangtze, it is separated by the Han from the city of Hanyang and by the Yangtze from Wuchang. Hanyang is the site of a government arsenal and of the iron furnaces and rolling mills of the Han-ye-ping Company; Wuchang is the provincial capital. The three cities together have a population of about 1,000,000. Ocean-going steamships are able to reach Hankow, 630 miles from the sea, except in seasons of very low water. Hankow is also destined to be a great railway center; a trunk line connects it with Peking, 754 miles to the northeast; and it is also the headquarters of the Hukwang Railways, which, when the war broke out, were being built by the "Four-Power Group." German interests have since been eliminated. Two main lines are being planned, one from Hankow westward into Szechwan and the other southward towards Canton. The latter will connect with the line being built northward from Canton by a Chinese company. There is at present a gap of about 280 miles between the two railheads. The iron for the blast furnaces at Hanyang is brought from the Tayeh mine about 70 miles down the river; the coal comes from the Pingsiang mines in Kiangsi Province near the border of Hunan, whence it was transported until recently by rail to the Siang River and then by boat to Hanyang. Now that the Hankow-Canton Railway has been completed to Siangtan and beyond, an all-rail route is available as far as Wuchang, just across the river from Hanyang. Hankow is also one of the principal tea markets of China. There are large tea-firing establishments there, where the tea is prepared for export, and presses for the manufacture of brick tea that is shipped to Russia. Other exports are pig iron, wood oil, cotton and cotton yarn, jute, hides, skins, furs, vegetable tallow, and tobacco. The pig iron is mostly shipped to Japan. The wood oil is imported in large quantities into the United States, for the manufacture of varnish. It is expressed from the nuts of the *Aleurites cordata*. The cotton yarn is manufactured in Wuchang, where the late Viceroy, Chang Chih-tung, built a modern cotton mill. Hankow is one of the ports afflicted with too many concessions. Five foreign governments have established settlements there, each with its own municipal organization: British, Russian, French, German, and Japanese. The Chinese Government, upon the declaration of war against

[62] Whole trade for 1917 passing through the Maritime Customs, Tls. 170,730,067; direct foreign trade, Tls. 49,523,054.

Germany, seized and occupied the German Concession.

Hupeh and Hunan Provinces

Hupeh means "North of the Lake"; Hunan means "South of the Lake." The lake to which reference is made is Tungting Lake, which is situated just inside the northern boundary of Hunan. These two provinces were formerly included in one administration known as the "Hukwang." The province of Hupeh is mountainous in the northwest, but one-half of the province is a fertile plain. Hunan is wholly mountainous except in the vicinity of Tungting Lake. Hunan is rich in minerals, the most important of which are coal and antimony. In the southern part of the province the coal is anthracite, but further north are excellent deposits of bituminous. The largest deposits of antimony in the world are said to be found in this province. Other minerals are gold, silver, iron, copper, lead, and zinc; but there is very little mining by modern methods. Among the important exports are tea, coal, antimony, and wood. There are three open ports in the province: Changsha,[63] the capital, an important city of 250,000 inhabitants; Yochow, a small place of some 20,000 inhabitants, near the outlet of Tungting Lake; and Changteh, on the Yuan River, west of Tungting Lake, a city of about 150,000 inhabitants.

Kiangsi Province

One of the ancient overland routes from north to south passes through Hunan and crosses Cheling Pass into the province of Kwangtung. The Hankow-Canton Railway in the main follows this old road. But the route known as the "Ambassadors' Way" passes through the province of Kiangsi and crosses the range by Meiling Pass. This province, like its neighbor on the west, is mountainous; but Poyang Lake, connected with the Yangtze, in the northern part of the province and the Kan River, which flows into the lake from the south, furnish water communication for small steamers as far as the capital, Nanchang, and for smaller native boats as far as Nanan in the southern part. This is the province in which the celebrated Imperial Potteries are situated, no longer "Imperial" but still national property. In these potteries at Kingtehchen the finest porcelain in the world is made. The word "kaolin," by which we designate the material from which porcelain is made, is nothing more than the two Chinese words, "kao lin" (high ridge), the name of the hills from which the clay is obtained.

Kiukiang[64] is the only open port in the province, situated on the Yangtze River near the outlet of Poyang Lake. It is noted for its manufacture of fine silverware, its porcelain shops, and its tea factories. In the mountains

[63] Whole trade in 1917, Tls. 27,492,228; direct foreign trade, Tls. 1,358,882.

[64] Population, 36,000; whole trade in 1917, Tls. 41,936,034; direct foreign trade, Tls. 2,145,086.

not far away the foreign residents of central China have established a summer resort, called Kuling. A railway recently completed connects Kiukiang with the provincial capital, Nanchang.

Continuing our descent of the river, there is but one other open port that remains to be mentioned, Wuhu,[65] in the province of Anhwei. This is the great rice port of China. It is a rather unsightly town of about 137,000 inhabitants.

There are several other cities on the Yangtze at which foreign steamers are allowed to touch, but only to land or ship passengers and their baggage. This valley of the Yangtze comprises an area of 700,000 square miles and is inhabited by some 200,000,000 people. It is here that the foreign merchant finds his best market.

Shantung

Between the mouths of the Yangtze Kiang and the Hwang Ho the promontory of Shantung lifts itself above the great plain and carries the coast line far out towards the east. The province to which the name Shantung is applied is mountainous in the eastern part but level in the western. It is the most densely populated province in China. It contains 56,000 square miles and 37,000,000 inhabitants. It is the holy land of the Chinese,[66] the birthplace and the burial place of their two greatest sages, Confucius and Mencius, and overshadowed by the sacred mountain, Tai Shan. The principal minerals are coal, iron, gold, and gypsum. There are also deposits of copper and lead. An American company is operating a gold mine in the province. Fourteen cities and towns in the province have been opened to foreign residence and trade, nine of them only since the presentation of the "Twenty-one Demands" by Japan in 1915. The oldest open port is Chefoo,[67] on the northern coast. It was once a port of some importance, and its beach attracted the foreign residents of China in the summer time. But the seizure of Kiaochow Bay by the Germans in 1897 and the development of Tsingtao[68] together with the construction of the Shantung Railway connecting Tsingtao with the provincial capital Tsinan, 254 miles inland, has drawn off a large share of the trade that formerly found an outlet at Chefoo. Tsingtao has a splendid, well-sheltered harbor, Chefoo an open roadstead. Tsingtao has rail connection with the interior, Chefoo is cut off by mountains from the hinterland. Efforts are being made by the people of Chefoo to overcome these handicaps by the building of a breakwater for the port and by the construction of a railway that will facilitate communication with inland cities. It is confronted now by another handicap scarcely less serious, the opening of Lungkow, a neighboring port, upon the demand of the Japanese, and the building of a

[65] Population, 108,610; whole trade, Tls. 19,447,194; direct foreign trade, Tls. 1,553,393.

[66] See the article "Shantung," *Journ. of Geogr.*, Vol. 18, 1919, pp. 312-316.—Edit. Note.

[67] Population, 54,450; whole trade in 1917, Tls. 32,233,419; direct foreign trade, Tls. 12,722,356.

[68] Population, 77,052; whole trade, Tls. 57,782,991; direct foreign trade, Tls. 34,723,973.

railway from this new port to connect with the Shantung Railway, now also under their control.

Japan's Establishment of a Foothold in Shantung

In August, 1914, as is well known, Japan presented an ultimatum to Germany, demanding the surrender of the German leased territory of Kiaochow, to be handed back "eventually" to China. No response having been made by Germany, in September Japan invaded the province of Shantung from the port of Lungkow on the northern shore, a hundred miles from the nearest point in the leased territory, in utter disregard of China's rights as a neutral and in spite of China's protests. Great Britain found no difficulty in landing her forces in the leased territory. China, finding her protests unavailing, declared a zone of belligereney, extending a hundred miles west of the boundary of the leased territory. But Japan disregarded this also. After marching across neutral territory, seizing telegraphs and post offices, billeting her troops upon the unwilling Chinese peasants and killing those who resisted, she seized the Shantung Railway; but, instead of confining her operations to the belligerent zone and turning her face towards Tsingtao, she marched westwards to Tsinan and took possession of the whole line. After the surrender of Tsingtao she established civil government at various points along the line, in places far from the leased territory. This, of course, was a violation of China's sovereign rights. After the capture of Tsingtao, there being no further need of military operations in Shantung, China abolished the zone of belligereney and requested Japan to withdraw her troops to the vicinity of the leased territory, where alone they had any right to be.

Japan's "Twenty-one Demands" on China

Japan claimed that this was an unfriendly act and presented the notorious "Twenty-one Demands." Under dire threats she warned China to keep them secret and gave out to the foreign powers that there were but eleven demands, concealing in this way the most offensive. After months of negotiation and after having landed in China two additional divisions of troops, Japan issued an ultimatum. As usual, China was unprepared and had to yield to the greater part of the demands. Among other things the demands included one to the effect that China should give assent to any arrangement which Japan might make with Germany as to the disposition of her former rights in Shantung. In an exchange of notes annexed to the convention Japan agreed that, when she should obtain the free disposition of the leased territory, she would return it (but not the railway, mines, or other economic rights) to China upon condition that Japan have a concession under her exclusive jurisdiction at some place within the leased territory. Other conditions were that the whole of

Kiaochow Bay was to be opened as a commercial port, an international concession to be established if desired by other foreign powers, and the disposition of German properties to be arranged by China and Japan by mutual agreement before the restoration.

This is the promise which Japan has repeatedly said since the Peace Conference she means to keep. To the careless observer it reads as though something of worth were to be returned to China. But, if carried out as expressed in this agreement, it means merely that in exchange for a lease which still has 78 years to run Japan will receive a perpetual lease to the only part of the leased territory that is worth anything, i. e. to the city and port of Tsingtao—a concession under her exclusive jurisdiction. In addition to this the Shantung clause of the treaty gives her the properties of Germany, concerning which she was to arrange with China after the Peace Conference.

The Shantung Railway

In September, 1918, the Chinese Government, in order to get rid of the civil government established by Japan along the Shantung Railway outside the leased territory, agreed in a convention with Japan to have the railway converted into a Sino-Japanese enterprise. It was stipulated that the railway should be policed by Chinese under the direction of Japanese "instructors" (euphemism for "officers"). At the same time in another convention China agreed in return for a loan to grant to Japan the option formerly held by Germany on the extension of the Shantung Railway westward and the construction of a branch line that will connect Tsingtao with the great trunk line railway that is being built from the coast into northwestern China, where it is expected eventually to be extended to meet the Russian Central Asian Railway. Under the administration of Germany Kiaochow Bay became the finest harbor in northern China, and these projected rail connections will make it the most available outlet for the trade of northern and western China. At present the principal exports from Tsingtao and Chefoo are pongee, straw braid, bean oil, and peanut oil.

Chihli Province

North of Shantung lies the metropolitan province, Chihli, in which Peking,[69] the national capital, is situated. Peking is not an open city and therefore does not properly call for description in this paper. But large numbers of Europeans, Americans, and Japanese are living there, some of them for purposes of trade. They are there by sufferance, however, and not by right, except that the tolerance may be said to have created a prescriptive right.

[69] Population about 700,000.

The province of Chihli has seven open cities, the most important of which is Tientsin, the port for the capital. It is situated at the junction of four rivers: the Pei Ho, the Hun Ho, the Puto Ho, and the Laochang Ho, which together form the Hai Ho, emptying into the Gulf of Chihli at Taku 35 miles below Tientsin. The Grand Canal at Tientsin enters the Pei Ho, by which stream in olden times communication was had with Tungchow and Peking. A canal connects Tungchow with the capital. Now the journey from Tientsin to Peking, 84 miles distant, can be made by rail in three hours. This railway, the Peking-Mukden line, connects Tientsin also with the coal mines at Tangshan, about 80 miles to the northeast, and with Chinwangtao, 160 miles in the same direction near the terminus of the Great Wall. Chinwangtao is the winter port of Tientsin. When the Hai Ho is frozen steamers can still go alongside the pier at Chinwangtao. The Hai Ho had become so badly choked with silt by 1900 that the Protocol of 1901 provided for the organization of a conservancy board, which has since greatly improved the channel and by dredging increased the depth of water on the Taku bar. It was here, in the attack of the British and French upon the Taku forts in 1859, that the American Commodore Tattnall excused his violation of international law, the towing of boatloads of British marines into action, by declaring that "blood is thicker than water."

Tientsin

Tientsin,[70] however, no longer depends wholly upon water for communication with the outside world; it is connected by rail with Pukow, on the Yangtze opposite Nanking, 674 miles south, and via Tsinan with Kiaochow, 500 miles to the southeast. As a punishment for its part in the "Boxer" rising, Tientsin was deprived of its city wall, but it has been greatly benefited thereby. A wide boulevard with an electric street-car line has taken its place. Before the world war there were nine municipal governments functioning at Tientsin: that of the Chinese, with jurisdiction over the native city, and those of eight foreign governments, each presiding over its own settlement. These powers were Great Britain, France, Germany, Japan, Austria, Italy, Russia, and Belgium. After China entered the war the Chinese Government seized and occupied the Austrian and German concessions. Tientsin lies below the level of the sea at high tide but is protected by dykes. The floods of 1917 swept over these embankments and covered the city and settlements to the depth of several feet in places.

Tientsin is the headquarters of the Changlu salt district, from which great quantities of salt are distributed by the gabelle throughout northern China. The salt is evaporated by exposure of the brine to the sun in shallow vats in the plain. The sea water is pumped by windmills whose sails,

[70] Whole trade in 1917, Tls. 142,360,661; direct foreign trade, Tls. 70,887,522.

moving horizontally around a vertical shaft, present an odd appearance to the traveler.

When there were no railways Tientsin was the starting point of the caravans that conducted overland trade with Russia via Kalgan, Urga, and Kiakhta, as well as those that trafficked with Central Asia. This trade still has importance but only in so far as Mongolia and Chinese Turkestan are concerned. The through shipments to and from Russia find a more expeditious route over the Trans-Siberian Railway, which is reached by the Peking-Mukden and South Manchuria Railways.

The principal products of Mongolia, Turkestan, and northern China that find export at Tientsin are hides, hair, sheepskins, goatskins, wool, camels' hair, hemp, jute, cottonseed, rapeseed, linseed, beans, vegetable oils, salt, and the rugs for which Tientsin and Peking are celebrated. Coal is an item of increasing importance, and other articles of interest to American trade are rhubarb and licorice root.

Manchuria

Manchuria,[71] the old kingdom of the Manchus before they conquered China, is commonly known among the Chinese as the "Three Eastern Provinces." These three provinces are (1) Heilungkiang (Black Dragon River), i. e. the Amur, (2) Kirin (Lucky Forest), and (3) Shengking (Prosperous Capital), the name also of the old capital of the kingdom. The area of the three provinces is 363,700 square miles. The population is perhaps 10,000,000 or 12,000,000. This is very unevenly distributed, three-fourths or more being found in the southern province, Shengking. The Manchus form a very small part of the population. Japanese immigrants are coming in in considerable numbers, but they do not amount to 100,000. The middle province, Kirin, is thinly populated, and the northern still more sparsely settled. The northern half of Manchuria is drained by the Sungari, its tributary the Nonni, by the Amur, and the Ussuri, all of which are navigable for hundreds of miles: the Amur for 450 miles by steamers drawing 12 feet of water and for 1,500 miles by boats drawing 4 feet; the Sungari as far as Kirin, about 600 miles from its mouth, and the Nonni for 150 miles beyond its junction with the Sungari. The southern half of the dominion is drained on the west by the Liao and on the east by the Yalu. The former is navigable for steamers as far as Newchwang, about 30 miles from its mouth, but for native boats throughout its whole course in Manchuria. The Yalu, which forms the boundary between Manchuria and Korea, is navigable in its lower course.

The whole of the three provinces is mountainous except the plains that are watered by the Sungari and the Liao. Much of the country has been

[71] Richard, Comprehensive Geography of the Chinese Empire, Book II, Chapter 1 (pp. 486-508); Alexander Hosie: Manchuria: Its People, Resources, and Recent History, London, 1901.

very little explored. A large part of the soil has never been cultivated. In the north are extensive forests. In some parts there are stretches of pasture land. Where the soil is cultivated it is very fertile. The agricultural products are wheat, dura, the soy bean, millet, tobacco, hemp, and peas, and in the south rice and cotton also. A fine quality of pongee is produced also. This is manufactured from wild silk, as it is called, i. e. silk from worms that feed upon oak leaves. Beans, bean oil, and bean cake with the pongee make up a good part of the exports. Other articles of importance are furs and skins. The country is rich in minerals: gold, silver, coal, and iron. Copper and lead also are found. Mining is as yet little developed except that certain gold mines are worked by Chinese in the north, and coal mines by the Japanese along the South Manchuria and Mukden-Antung Railways.

Manchurian Railways

There are two systems of railways in Manchuria. In the north the Chinese Eastern, constructed by Russians and leased to a Russian company, crosses from west to east, forming in fact a section of the great Trans-Siberian line. From Harbin on the line a branch extends to the south as far as Kwangchengtze (Changchun), where it connects with the Japanese system. But the Russian lines are of the broad gauge, while the Japanese railways have the standard gauge. This makes necessary a transshipment of passengers and freight at Kwangchengtze. The Russians have also the right to build northwards from Harbin to the Amur. The Japanese main line, the South Manchuria Railway, connects at Kwanchengtze with a branch line to Kirin and at Mukden with the Chinese line to Peking and with the Japanese Mukden-Antung Railway, which joins the Korean railway over the bridge at Antung spanning the Yalu River. The South Manchuria line has a number of small branches, and there is under construction an important branch via Chengchiatun to Taonanfu.

In this great region with its fertile soil, temperate climate, and wonderful mineral resources, a country which is still for the most part undeveloped and but sparsely settled, there are 29 open cities and towns in the Three Eastern Provinces, to which should be added 8 others in eastern Inner Mongolia, which geographically may be considered as belonging to the same region. Few of these, however, deserve special notice.

Newchwang and Dairen

Newchwang[72] has been opened longer than any other. For many years it was the only open port in Manchuria. It is situated on the Liao River about 30 miles above its mouth. The port is located about ten miles below the city at the village of Yingkow. Prior to the Russo-Japanese war Newchwang ranked fifth among the treaty ports in the value of its trade. But,

[72] Population, 56,683; whole trade in 1917, Tls. 28,829,499; direct foreign trade, Tls. 7,883,798.

since that war gave Japan possession of Port Arthur and Dalny and led to the opening of many other towns in Manchuria, the importance of Newchwang has greatly declined. The development of the leased territory of Kwantung and the encouragement given to shipment over the South Manchuria Railway through Dalny (now Dairen) has placed Newchwang under a handicap. The improvement of the Liao River, which affords cheap water transportation into the interior, will lessen this handicap in some degree. This work has already been undertaken.

Dairen with its magnificent harbor is the principal port in the Japanese leased territory of Kwantung. During the world war its trade increased enormously by reason of the shipments by that route into Siberia. In 1917 it ranked second among the open ports of China.[73]

Other Ports in Manchuria

Since the completion of the bridge over the Yalu River has given Japan the right to claim a reduction of duties on imports over a land frontier, in accordance with the precedent of Russo-Chinese overland trade, the importance of Antung has considerably increased. Antung is situated but 15 miles from the mouth of the Yalu, and vessels drawing from 8 to 10 feet of water can come up to its wharves. The Yalu lumber trade is an important one. There are also valuable mineral deposits in the vicinity, mostly undeveloped, among which American consular reports mention asbestos. Antung is distant 188 miles by rail from Mukden.

Mukden is more important politically than commercially, since it is the capital of the governor general; but, as intimated above, it is also an important railway center. To the traveler it is of interest as the site of the old Manchu palace and the tombs of early emperors of that dynasty.

A little-known region of Manchuria is the Yenchi district of Kirin Province on the Korean frontier in the valley of the Tumen River. It was practically uninhabited until 1886. Koreans began to immigrate into the district about that time but without the consent of China until 1892. There are now nearly 100,000 of them in western Yenchi. It is a region of fertile valleys separated by lofty ranges, with an excellent climate and undeveloped mineral resources. It is still very sparsely settled. There are five open towns in this district. The opening of Hunchun was provided for in the treaty of 1905 between China and Japan, and in 1909 four other towns were opened; Lungchingtsun, Chützechieh, Totaokow, and Paitsaokow. Chützechieh, a town of 3,000 inhabitants, is the principal place in the region. The *taotai* moved his official residence from Hunchun to Chützechieh in 1910.

Lungchingtsun,[74] on a branch of the Tumen River, is more favorably

[73] Whole trade, Tls. 135,945,180; direct foreign trade, Tls. 109,850,038.

[74] Population, 650; whole trade in 1917, Tls. 1,281,113.

situated than the others for trade with Korea. It is but 26 miles from the frontier but is separated by a range of mountains over which the traffic must pass. But at the frontier it connects by rail with the Korean port of Seishin. A railway is planned from Kirin to this region, a distance of 320 miles.

Kirin, capital of the province of the same name, is a city of 100,000 inhabitants and has some commercial importance. Its exports are tobacco, timber, and furs.

Harbin[75] is composed of three towns: the old Chinese city, the port on the Sungari, and the new settlement at the railway station, which is really a Russian city on Chinese territory. There are some large flour mills there, but trade has been much injured by the abolition in recent years of the free trade zone on the Russian side of the frontier.

Classification of Chinese Open Ports

The open ports of China may be divided into five classes. In the first class are included those cities at which no area is set aside for the creation of a foreign settlement. Such a port is Chefoo.

The second class comprises those in which concessions in the nature of perpetual leases of land have been granted to one or more powers for the establishment of a settlement under the control of the lessee power, which issues deeds to the land renters but also pays a stipulated annual rent to China in recognition of Chinese sovereignty. In these concessions the police powers are exercised by the lessee. In some a municipal council is elected by those paying taxes of a certain amount, but all acts of the council must be approved by the consul of the lessee government. In other national settlements there is no council whatever; the control is exercised by the consul alone. Tientsin and Hankow are examples of this sort.

The third class embraces those ports where there have been created international settlements governed by the foreign residents themselves, who elect a municipal council that exercises the usual powers of such bodies. Shanghai and Amoy are ports of this sort. One objectionable feature at Shanghai is the exercise by absentee landlords of the right of suffrage. This is done by proxy, one person at times holding ten or a dozen proxies.

In the fourth class are placed those cities which have been opened by China upon her own initiative and with regulations adopted by her own government. At these ports there is usually established a quarter for the residence of foreigners, but the municipal government is Chinese. Such are Tsinan and Changsha.

In all the four classes mentioned the foreign resident is under the jurisdiction and protection of his own government, represented by the consul.

[75] Population, 28,600; whole trade of the district (3 ports) in 1917, Tls. 39,500,000.

The fifth class includes the open ports in territories that have been leased for a term of years to a foreign power. In these ports the lessee power exercises sovereignty during the continuance of the lease. At the same time the Chinese customs functions at the port and collects duties on all imports going from the free area into China and on all exports coming from China into the free area but pays a proportion of the revenues thus derived to the lessee power for municipal expenses. Kiaochow leased territory is of this sort, and Tsingtao is a port in that territory where such procedure obtains. In such ports there is no exercise by any consul of extraterritorial jurisdiction. He is accredited to the lessee power, and his nationals are amenable to its jurisdiction.

The Remedy for the Anomalous Political Conditions in Chinese Open Ports

The creation of open ports in China in the first instance was due to the Chinese desire to segregate the foreign residents so as to keep them under control. When the exercise of extraterritoriality was established by the treaties negotiated after the first war with Great Britain the limitation of foreign residence to certain ports was a natural corollary, for it would be extremely difficult for a consul to exercise jurisdiction over his nationals if they were allowed to live and transact business at will in any part of the vast territory of China. The recent wholesale opening of inland towns and villages in certain provinces is a striking departure from the earlier practice. It seems to betray on the part of the power concerned a deliberate intention to settle its subjects in all parts of these provinces. Apparently there is a desire to obtain political rather than commercial advantages. The methods employed by this power in the past show that it does not hesitate to avail itself of any pretext for interference with local authorities, even to the extent of attempting to exercise police jurisdiction over Chinese citizens outside of foreign settlements in direct violation of Chinese sovereignty.

The cure for this anomalous condition of affairs would seem to be the surrender by foreign powers of the right of extraterritoriality and the opening by China of the whole country to foreign residence. It is not practicable to do this immediately, but it is possible to accomplish it gradually. China has already revised her codes and is establishing modern courts as rapidly as men can be trained for the judiciary. It is worth considering whether it may not be wise for the foreign powers to hasten this process by some such method as is being employed in Siam, where certain powers have agreed to place their nationals under the jurisdiction of certain courts provided with foreign advisers and subsequently to place them under the jurisdiction of the ordinary courts, the latter to function just as soon as the required codes are promulgated.

THE PROBLEM OF MAYDA, AN ISLAND APPEARING ON MEDIEVAL MAPS

By WILLIAM H. BABCOCK

Of all the legendary islands and island names on the medieval maps, Mayda has been the most enduring. The shape of the island has generally approximated a crescent; its site most often has been far west of lower Brittany and more or less nearly southwest of Ireland; the spelling of the name sometimes has varied to Maida, Mayd, Mayde, Asmaida, or Asmayda. The island had other names also earlier and later and between times, but the identity is fairly clear. As a geographical item it is very persistent indeed. Humboldt about 1836 remarked that, out of eleven such islands which he might mention, only two, Mayda and Brazil Rock, maintain themselves on modern charts.[1] In a note he instances the world map of John Purdy of 1834. However, this was not the end; for a relief map published in Chicago and bearing a notice of copyright of 1906 exhibits Mayda. Possibly this is intended to have an educational and historic bearing; but it seems to be shown in simple credulity, a crowning instance of cartographic conservation.

Possible Arabic Origin of Name

If Mayda may, therefore, be said to belong in a sense to the twentieth century, it is none the less very old, and the name has sometimes been ascribed to an Arabic origin. Not very long after their conquest of Spain the Moors certainly sailed the eastern Atlantic quite freely and may well have extended their voyages into its middle waters and indefinitely beyond. They named some islands of the Azores, as would appear from Edrisi's treatise and other productions; but these names did not adhere unless in free translation. The name Mayda was not one of those that have come down to us in their writings or on their maps, and its origin remains unexplained. It is unlike all the other names in the sea. Perhaps the Arabic impression is strengthened by the form Asmaidas, under which it appears (this is nearly or quite its first appearance) on the map of the New World in the 1513 edition of Ptolemy (Fig. 1).[2] But any possible significance vanishes from the prefixed syllable when we find the same map turning Gomera into Agomera, Madeira into Amadera, and Brazil into Obrassil. Evidently this map maker had a fancy for superfluous vowels as

[1] A. von Humboldt: Examen critique de l'histoire de la géographie du Nouveau Continent et des progrès de l'astronomie nautique aux quinzième et seizième siècles. 5 vols., Paris, 1836-39; reference in Vol. 2, p. 163

[2] Konrad Kretschmer: Die Entdeckung Amerika's in ihrer Bedeutung für die Geschichte des Weltbildes. 2 vols. (text and atlas), Berlin, 1892; atlas, Pl. 12, map 1.

a beginning of his island names. He may have been led into it by the common practice of prefixing "I" or the alternative "Y" (meaning Insula, Isola, Ilha, or Innis) instead of writing out the word for island in one language or another.

However, there is a recorded Arabic association of this particular island under another name. It had been generally called Mam or Man, and occasionally other names, for more than a century before it was called Mayda. Perhaps the oldest name of all is Brazir, by which it appears on the map of 1367 of the Pizigani brothers (Fig. 2),[3] a form evidently modified from Brazil and shared with the round island of that name then already more than forty years old on the charts. The Brazir which we specially have

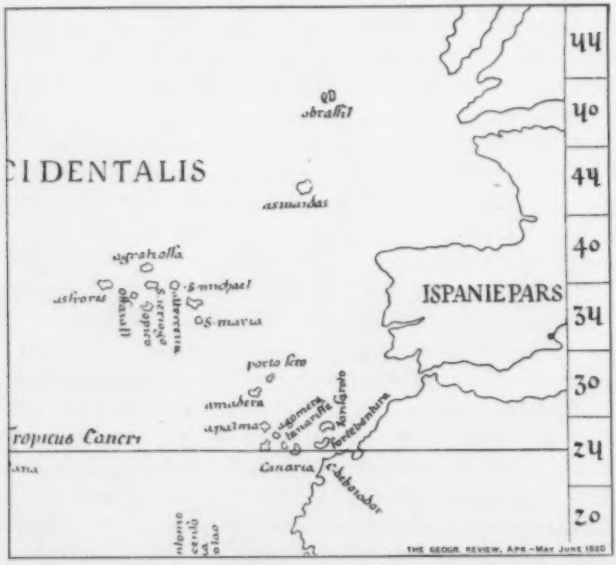


FIG. 1—Section of the map of the New World in the 1513 edition of Ptolemy showing the islands of Mayda (asmaidas) and Brazil (obrassil) off the coast of Western Europe. (From Pl. 12, map 1, of Kretschmer's atlas, cited in footnote 2.)

to do with bears roughly and approximately the crescent form, which later became usually more neat and conventionalized under the name Man or Mayda. It appears south (or rather a little west of south) of the circular Brazil, which is, as usual, west of southern Ireland and a little south of west of Limerick. The crescent island is also almost exactly in the latitude of southern Brittany, taking a point a little below the Isle de Sein, which still bears that name. In this position there may be indications of relation

[3] [E. F.] Jomard: Les monuments de la géographie, ou recueil d'anciennes cartes européennes et orientales....publiés en fac-similé de la grandeur des originaux, Paris [1842-62], Pl. X, 1.

with both Brittany and Ireland. The former relation is pictorially attested by three Breton ships. One of them is shown returning to the mouth of the Loire. A second has barely escaped from the neighborhood of the fateful island. A third is being drawn down stern foremost by a very aggressive decapod which drags overboard one of the crew; perhaps she has already shattered herself on the rocks, offering the opportunity of such capture in her disabled state. A dragon flies by with another seaman, apparently snatched from the submerging deck. Blurred and confused inscriptions in strange transitional Latin seem to warn us of the special dangers of navigation in this quarter; the staving of holes in ships, the tawny monsters, known to the Arabs, which rise from the depths, the dragons that come flying to devour. The words "Arabe" and "Arabour" are readily decipherable; so is "dragones." Perhaps there is no statement that Arabs have been to that island, for their peculiar experience may belong to some other quarter of the globe; but the verbal association is surely significant. The name Bentusla (Bentufla?) applied to this crescent island by Bianco in his map of 1448[4] has sometimes been thought to have an Arabic origin; but one would not feel safe in citing this as absolute corroboration. The Breton character of the ships, however, may be gathered (as well as from their direction and behavior) from the barred ensigns which they carry, recalling the barred standard set up at Nantes of Brittany, in Dulcert's map of 1339,[5] just as the *fleur-de-lis* is planted by him at Paris.

Mayda and the Isle of Man

We have, then, in this fourteenth-century island a direct recorded association with the Arabs, followed long after by what have been thought to be Arabic names. We have also a pictorial and cartographical connection with Brittany and also an indication of relations with Ireland. This last is fortified by its next and, except Mayda, its most lasting name.

The great Catalan map of 1375[6] (Fig. 3) calls it Mam, which should doubtless be read as Man, for it was common to treat "m" and "n" as interchangeable, no less than "u" and "v" or "i" and "y." Thus Pareto's map of 1455[7] turns the Latin "hanc" into "hamc" and "Aragon" into "Aragom." On some of the early maps, e. g. that of Juan da Napoli (fif-

[4] Theobald Fischer: Sammlung mittelalterlicher Welt- und Seekarten italienischen Ursprungs. 1 vol. of text and 17 portfolios containing photographs of maps. Venice, 1871-86; reference in Portfolio 11 (Facsimile della carta nautica di Andrea Bianco dell' anno 1448), Pl. 3. See also Kretschmer, *op. cit.*, text, p. 184.

[5] A. E. Nordenskiöld: Periplus: An Essay on the Early History of Charts and Sailing Directions, transl. by F. A. Bather. Stockholm, 1897, Pls. 8 and 9.

[6] *Ibid.*, Pl. 11.

[7] Kretschmer, Entdeckung Amerika's, etc., atlas, Pl. 5. (A section of this map, showing the island of Mam in the upper right-hand corner (the name being partly cut off), is reproduced in the *Geogr. Rev.* for February, 1920, Vol. 9, p. 120.—Edit. Note.)

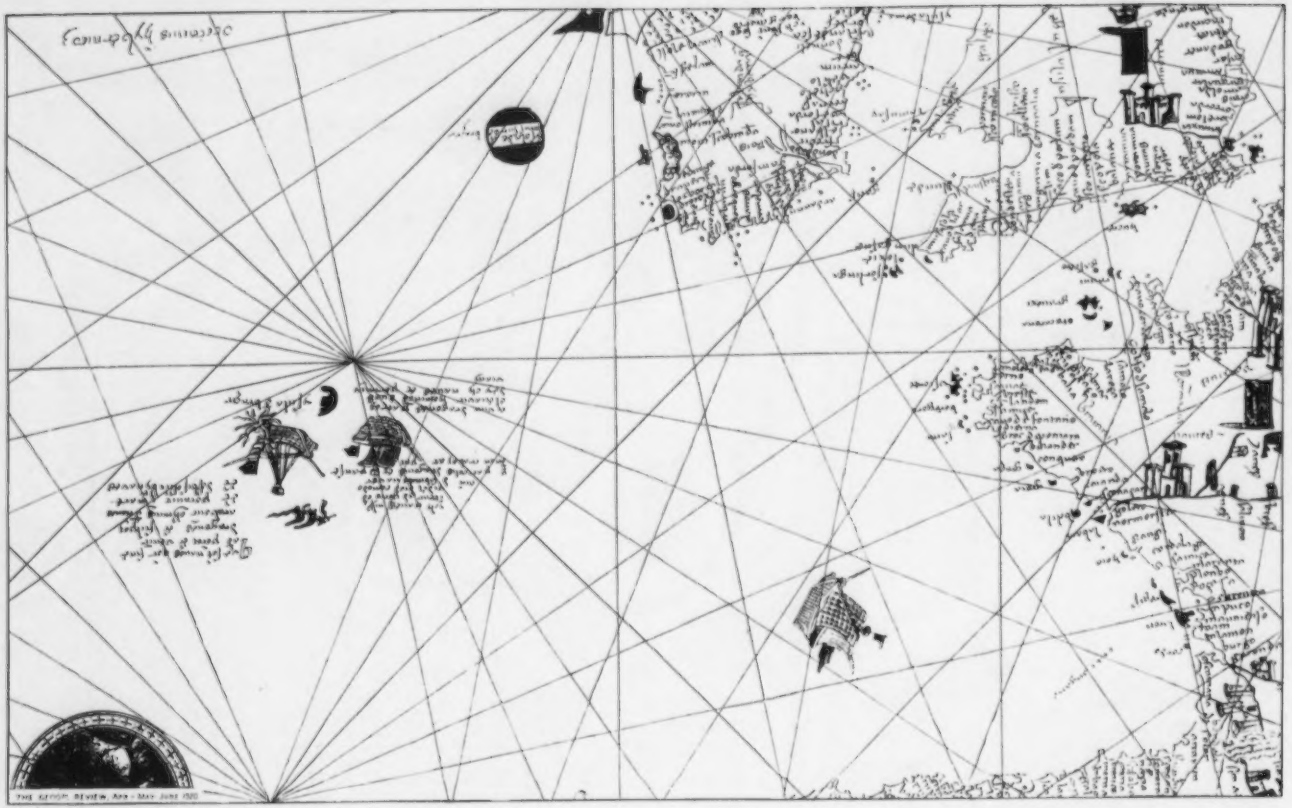


FIG. 2—Section of the map of 1367 of the Pizigani brothers showing the island of Mayda (here called by its earliest name "Brazir") in the latitude of Brittany and the island of Brazil off the coast of Ireland. In the original south is at the top of the map, and in this properly oriented reproduction the inscriptions relating to the islands are inverted. (From Pl. X, 2, of Jomard, cited in footnote 3.)

teenth century),[8] the proper spelling "Man" is retained, just as it is retained and has been ever since early Celtic days, in the name of the home of "the little Manx nation" in the Irish Sea. That the same name should be carried farther afield and applied to a remote island of the Atlantic Ocean is quite in accordance with the natural course of things and the general experience of mankind. No doubt the name Man might be derived from other sources, but the chances are in this instance that the Irish people whose navigators found Brazil Island (or imagined it, if you please) did the same favor for the crescent-shaped "Man," quite overriding for a hundred years any preceding or competing titles.

Almost immediately there was some competition, for the Pinelli map of 1384[9] calls it Jonzele (possibly to be read I Onzele, a word which has an Italian look but is of no certain derivation), reducing the delineation of the island to a mere shred, bringing Brazil close to it, and giving the pair a more northern and more inshore location. Another map of about the same period follows this lead, but there the divergence ended. Soleri of 1385[10] reverted to the former representation; and about the opening of the fifteenth century the regular showing of the pair was established—Brazil and Man, circle and crescent, by those names and in approximately the locations and relative position first stated.

It is true that the crescent island is sometimes represented without any name, as though it were well enough known to make a name unnecessary. But during the fifteenth century, when it is called anything, with a bare exception or two, it is called Man. Its shape and general location are substantially those of the Catalan map of 1375 on the maps of Juan da Napoli; Giraldi, 1426;[11] Beccario, 1426[12] and 1435;[13] Bianco, 1436[14] and 1448; Beninceasa, 1467[15] and 1482;[16] Roselli, 1468;[17] the Weimar map,

[8] Listed as No. 17 in Justin Winsor: The Kohl Collection (Now in the Library of Congress) of Maps Relating to America, Library of Congress, Washington, D. C., 1904, p. 27.

[9] A. E. Nordenskiöld, Periplus, Pl. 15.

[10] *Ibid.*, Pl. 18.

[11] Theobald Fischer, Sammlung, etc., Portfolio 8 (Facsimile del Portolano di Giacomo Giraldi di Venezia dell'anno 1426).

[12] A section of this map, hitherto unpublished, is shown in the *Geogr. Rev.*, Vol. 8, 1919, opposite p. 40. The map does not extend far enough north, however, to show the island under discussion. Cf. p. 43 of the same volume.

[13] Gustavo Uzielli: Mappamondi, carte nautiche e portolani del medioevo e dei secoli delle grandi scoperte marittime construiti da italiani o trovati nelle biblioteche d'Italia, Part II (pp. 280-390) of "Studi Bibliografici e Biografici sulla Storia della Geografia in Italia," published on the occasion of the Second International Geographical Congress, Paris, 1875, by the Società Geografica Italiana, Rome, 1875; reference on Pl. 8 (the second edition, Rome, 1882, does not contain the plates). (For a reproduction of a section see the *Geogr. Rev.* for February, 1920, Vol. 9, p. 116.—EDIT. NOTE.)

[14] A. E. Nordenskiöld, Periplus, Pls. 20 and 21.

[15] *Ibid.*, Pl. 33.

[16] Kretschmer, Entdeckung Amerika's, etc., atlas, Pl. 4, map 1. A section is reproduced in the *Geogr. Rev.* for February, 1920, Vol. 9, p. 121, showing the island (unnamed) in the upper right-hand corner.

[17] E. L. Stevenson: Facsimiles of Portolan Charts Belonging to the Hispanic Society of America, *Publs. of the Hispanic Soc. of Amer. No. 10*, New York, 1916, Pl. 2.

(probably) about 1481;[18] Freducci, 1497;[19] and others—arguing surely a robust and confident tradition.

Resumption of Name "Mayda"

On sixteenth-century maps this island is still generally presented, though lacking on those of Ruysch, 1508;[20] Coppo, 1528;[21] and Ribero, 1529;[22] but suddenly and almost completely the name Mayda in its various forms takes the place of Man, a substitution quite unaccounted for. There are hardly enough instances of survival of the older name to be worth mentioning. Was there some resuscitation of old records or charts, now

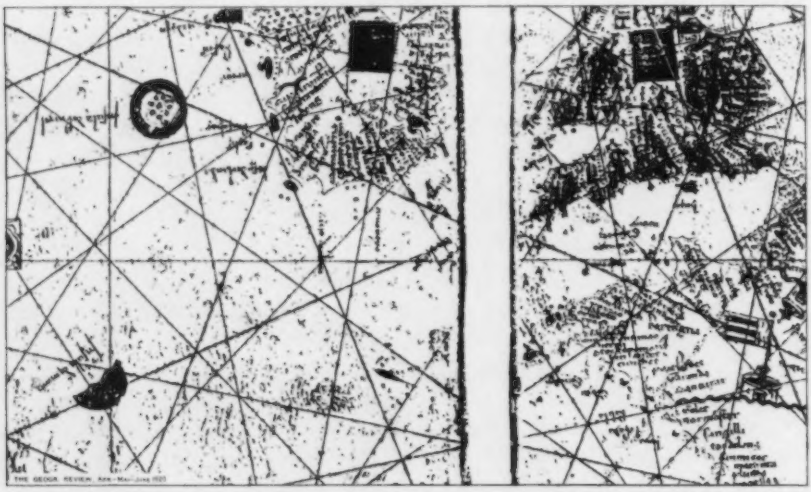


Fig. 3—Section of the Catalan map of 1375 showing the islands of Mayda ("Insula de Mam") and Brazil off the coast of Brittany and Ireland (inscriptions inverted). From Pl. 11 of Nordenskiöld's "Periplus", cited in footnote 5.

lost again, which thus overcame the Celtic claim and supplied an Arabic or at least a quite alien and unusual designation? The little mystery is not likely ever to be cleared up. The previously mentioned map from the Ptolemy edition of 1513, which perhaps first introduces it, also presents several other innovations in departing from the crescent form and shifting the island a degree or two southward; and these changes surely seem to hint at some fresh information. That there was no supposed change of identity

[18] W. H. Babcock: Indications of Visits of White Men to America before Columbus. *Proc. 19th Internatl. Congr. of Americanists, Held at Washington, Dec. 27-31, 1915* [Smithsonian Institution], Washington, D. C., 1917, pp. 469-478; map on p. 476.

[19] A. E. Nordenskiöld, Periplus, Pl. 22.

[20] Kretschmer, Entdeckung Amerika's, etc., atlas, Pl. 9, map 3; also in A. E. Nordenskiöld: Facsimile Atlas to the Early History of Cartography, Stockholm, 1889, Pl. 32.

[21] Kretschmer, Entdeckung Amerika's, etc., atlas, Pl. 14, map 5.

[22] *Ibid.*, Pl. 15.

is shown by the fact that succeeding cartographers down to and beyond the middle of that century revert generally to the established crescent form and to nearly the same place in the ocean previously occupied by Man, while applying the new name Mayda. Thus an anonymous Portuguese map of 1519 or 1520,[23] reproduced by Kretschmer, and the graduated and

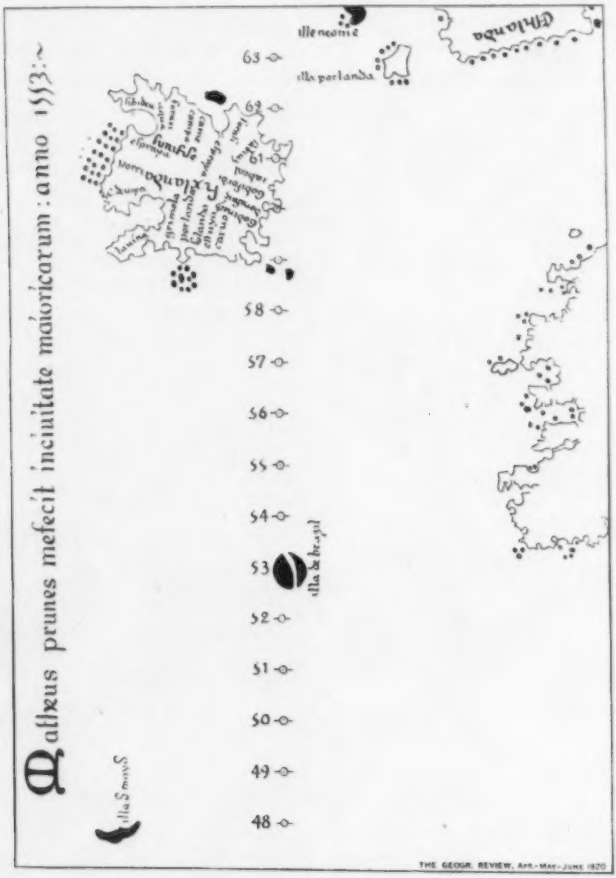


FIG. 4—The Prunes map of 1553 showing Mayda in latitude 48° N., southwest of Ireland. (From Pl. 4, map 5, of Kretschmer's atlas, cited in footnote 2.)

numbered map of Prunes, 1553 (Fig. 4),[24] concur in placing Mayda or Mayd at about latitude 48° N., the latitude of Quimper, Brittany, and almost exactly the same as that given by the Pizigani to the crescent island on its first appearance on the maps as a clearly recognizable entity.

[23] *Ibid.*, Pl. 12, map 2.
[24] *Ibid.*, Pl. 4, map 5.

Transference of Mayda to American Waters

The maps made after the world had become more or less familiarized with the details of modern discoveries, in this case as in most others of its kind, indicate little except the dying out of old traditions, whatever they may have been, and haphazard or conventional substitution of locations and forms or the influence of the new geographic facts and theories. Thus Desceliers' map of 1546,[25] a museum of strangely-named sea islands, makes the latitude of "Maidas" 47° and the longitude that of St. Michaels, but not long afterward Nicolay (1560;[26] Fig. 5) and Zaltieri (1566)[27] transferred the island to Newfoundland waters. Nicolay calls it "I man orbolunda," and places it just south of the Strait of Belle Isle. It is accompanied by Green Island and by Brazil, a little farther out on the Grand Banks where the Virgin Rocks may still be found at low tide. Taken together these three islands look like parts of a disintegrated Newfoundland. Zaltieri of 1566 gives Maida by that name more nearly the same outward location, though

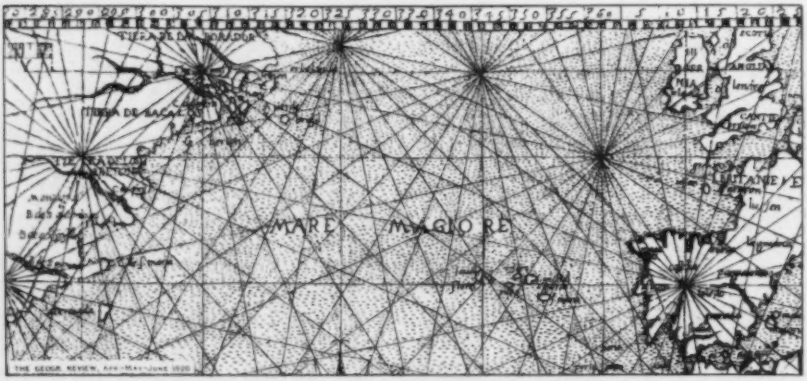


Fig. 5—Section of the Nicolay map of 1560 showing the islands of Mayda ("I man orbolunda") and Brazil transferred to the waters off the American coast. (From Pl. 27 of Nordenskiöld's "Periplus", cited in footnote 5.)

it is still distinctly American. Nicolay's name "orbolunda" is one of the many puzzling things connected with this island. His "Man" may be either a reversion to the fifteenth-century name, or, more likely, a modification of, or error in copying from Gastaldi's map-illustration[28] of Ramusio about ten years previously, which allots the same inclement site to an "isola de demoni" and depicts the little capering devils in wait there for their

[25] Kretschmer, Entdeckung Amerika's, atlas, Pl. 17; also A. E. Nordenskiöld, Periplus, Pl. 51.

[26] A. E. Nordenskiöld, Periplus, Pl. 27.

[27] Kretschmer, Entdeckung Amerika's, etc., atlas, Pl. 19, map 3.

[28] Justin Winsor: Cartier to Frontenac: Geographical Discovery in the Interior of North America in its Historical Relations, 1534-1700, with Full Cartographical Illustrations from Contemporary Sources, Boston and New York, 1894; reference on p. 60.

prey. It is likely, though, that Gastaldi had no thought of identifying it with Mayda. But the neighborhood of the island of Brazil and Green Island seem nearly conclusive evidence that Nicolay intended I Man for Mayda and had ascribed to it, by reason of evil association, the supposed attributes of Gastaldi's island. However, Ramusio himself in 1566,[29] the same year as Zaltieri, set his "Man" south of Brazil off the coast of Ireland. The only really important contributions of these maps are their testimony to the continued diabolical reports of Mayda, or Man, and the apparent conviction of Nicolay and Zaltieri that the island was after all American; a

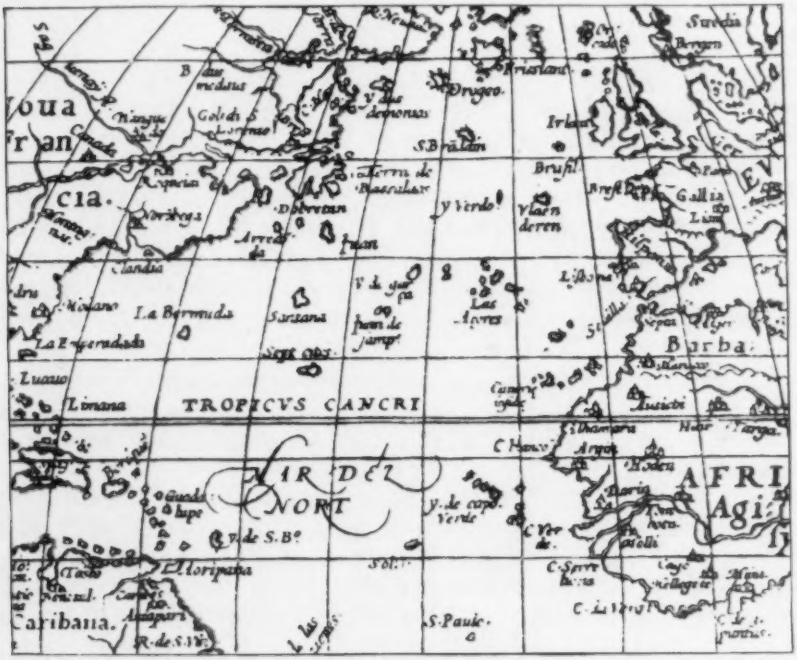


FIG. 6—Section of the Ortelius map of 1570 showing the island of Vlaenderen in the customary location of Mayda off the coast of Brittany. The island of Brazil is unchanged in name and position from the earlier maps. (From Pl. 46 of Nordenskiöld's "Facsimile Atlas", cited in footnote 30.)

suggestion that could have had no meaning and no support in the times when America was unrecognized. Evidently these map makers did not regard the inadequate western longitude of Mayda, or Man, in the older maps as a formidable objection. Presumably they were well aware how many of the insular oceanic distances as shown by these forerunners needed stretching in the light of later discovery. But their views with regard to an American Mayda seem to have ended with them, so far as map representation is concerned.

[29] E. A. Nordenskiöld, Periplus, Fig. 76, p. 163.

Possible Identity of Vlaenderen Island with Mayda

There is another curious and rather mystifying episodical divergence in the cartography of that period, this time on the part of the great geographers Ortelius and Mercator in their respective series of maps during the latter part of the sixteenth century, for example Ortelius of 1570[30] and Mercator of 1569 and 1587.[31] Ortelius presents as Vlaenderen an oceanic island which certainly seems intended for Mayda (Fig. 6), while Mercator shows Vlaenderen as lying about half-way between Brazil and Maida. The word has a Dutch or Flemish look. Of course there must be some explanation of it, but this is unknown to the writer. The natural inference would be that some skipper of the Low Countries thought he had happened upon it and reported accordingly. This was what occurred in the case of Negra's Rock, now held to be wholly fictitious though shown in many maps; and also in the case of the sunken land of Buss, now generally recognized as real and as a part of Greenland but recorded and delineated in the wrong place by an error of observation. It may be that Ortelius believed in a rediscovery of Mayda and that for some reason it should have the name latest given. But in spite of the prestige of these great names, Vlaenderen did not continue on the maps, while Mayda did, though in a rather capricious way.

Persistence of Mayda on Maps Down to the Modern Period

There would be little profit in listing the maps of the seventeenth, eighteenth, and nineteenth centuries which persisted by inertia and convention in the nearly stereotyped delineation of Mayda but, of course, with slight variations in location and name. Thus F. De Witte in 1660 shows "As Maydas" in about the longitude of Madeira and the latitude of Brittany; a French map, unnamed, of 1771 gives "Maida" the longitude of Palma (Canary Islands) and the latitude of Gascony; and a chart of currents by Findlay, 1853, locates "Mayda" in the longitude of Iceland and the latitude of the mouth of the Loire. But these representations have no significance except as to human continuity.

The evil reputation which was early established and seems to have hung about the island in later stages, assimilating the icy clashings and noises and terrors of the north as it had previously incorporated the monstrous fears of a warmer part of the ocean, is surely a curious phenomenon. I have fancied it may be responsible for the probably quite imaginary Devil Rock, which appears in some relatively recent maps, perhaps as a kind of substitute for Mayda, much in the fashion that Brazil Rock took the place

[30] A. E. Nordenskiöld: Facsimile Atlas to the Early History of Geography, Stockholm, 1889, Pl. 46. A section of this map, showing Vlaenderen, is reproduced in Fig. 6.

[31] A. E. Nordenskiöld, Facsimile Atlas, Pl. 47.

of Brazil Island when belief in the latter became difficult. The present view of the U. S. Hydrographic Office, as expressed on its charts, is that Negra's Rock, Devil Rock, Green Island, or Rock, and all that tribe are unreal "dangers," probably reported as the result of peculiar appearances of the water surface. Whether the possibility has been wholly eliminated of a lance of rock jutting up to the surface from great depths and not yet officially recognized, I will not presume to say; but it seems highly improbable that there is anything of the sort in the North Atlantic Ocean except the lonely and nearly submerged peak of Rockall, some 400 miles west of Britain, and the well-known oceanic groups and archipelagoes.

Probable Basis of Fact Underlying this Legendary Island

What was this island, then, which held its place in the maps during half a millennium and more, under two chief names and occasional substitutes, designations apparently received from so many different peoples? One cannot easily set it aside as a "peculiar appearance of the surface" or as a mere figment of fancy. But there is nothing westward or southward of the Azores except the Bermudas and the capes and coast islands of America. The identification with some outlying island of the Azores, as Corvo, for example, is an old hypothesis; and the grotesquery of that rocky islet seems to have deeply impressed the minds of early navigators, lending some countenance to the idea. But the Laurenziano map of 1351[32] and the Book of the Spanish Friar[33] show that all the islands of the Azores group were known before the middle of the fourteenth century, and Corvo in particular had been given the name which it still holds. Man, afterward Mayda, appears on many maps of the fifteenth century which show also the Azores in full. Perhaps this is not conclusive, for there are strange blunders and duplications on old maps; but it is at least highly significant. If Man, or Mayda, were really Corvo or another island of the Azores group, surely someone would have found it out in the course of the fifteenth or sixteenth century, just as it came to be perceived after a time that the Azores had been located too near to Europe and just as Bianco's duplication of the Azores in 1448 had finally to be rejected. Mayda, if real, must have been something more remote and difficult to determine than Corvo.

Perhaps Nicolay and Zaltieri were right in thinking that Mayda was American, or at least was on the side of the Atlantic toward America. The latitude generally chosen by the maps would then call for Avalon Peninsula,

[32] Theobald Fischer, Sammlung, etc., Portfolio 5 (Facsimile del Portolano Laurenziano-Gaddiano dell' anno 1351), Pl. 4.

[33] Book of the Knowledge of All the Kingdoms, Lands and Lordships That Are in the World, and the Arms and Devices of Each Land and Lordship, or of the Kings and Lords who Possess Them. Written by a Spanish Franciscan in the middle of the 14th century. Published for the first time with notes by Marcos Jiménez de la Espada in 1877. Translated and edited by Sir Clements Markham. *Hakluyt Soc. Publs.*, 2nd Ser., Vol. 29, London, 1912. Reference on p. 29.

Newfoundland, often supposed to be insular in early days; or perhaps for Cape Breton Island, the next salient land feature. But that is an uncertain reliance, for the observations of pre-Columbian navigators would surely be rather haphazard, and they might naturally judge by similarity of climate. This would justify them in supposing that a region really more southerly lay in the latitude of northern France—for example Cape Cod, which juts out conspicuously and is curved and almost insular. Or by going farther south, although nearer Europe, they might thus indicate the Bermudas, the main island of which is given a crescent form on several relatively late maps. But we must not lay too much stress on this last item, for divers other map islands were modeled on this plan. We may be justified, then, in saying that Mayda was probably west of the middle of the Atlantic and that Bermuda, Cape Cod, or Cape Breton is as likely a candidate for identification as we can name.

CLOUDINESS IN THE UNITED STATES*

By ROBERT DeC. WARD
Harvard University

Effect of Cloudiness on Man

The amount of cloudiness affects man in many ways. In summer, cloudy days provide protection from the sun's rays. In winter, cloudy skies at night diminish nocturnal radiation, check the fall of temperature, and thereby reduce somewhat the need of fuel for heating purposes. Clear, calm winter nights are usually the coldest. On the other hand, dark overcast days in winter often seem colder than they really are because of their lack of sunshine. Such days necessitate an increased use of artificial light and hence of fuel for power purposes. The amount of cloud has distinct psychological effects. Continuously gray skies are depressing. Bright, sunny climates tend to make people cheerful. Steadily cloudless skies, on the other hand, easily become monotonous; the continued glare of the sun is tiring to the eyes, and one longs for clouds. The amount of cloud controls the duration of sunshine, the brightness of the sky, and the amount of diffused daylight. All these conditions have important relations to the distribution and growth of vegetation and to the development of microorganisms. Medical climatology is closely concerned with cloudiness and sunshine in relation to health and disease.

The thickness and kind of cloud, as well as the amount, are important. There is a great difference between the effect, psychological as well as economic, of a thin sheet of high cloud, like cirro-stratus, and of a low, dark cloud layer of strato-cumulus or nimbus. A sky largely covered with fine-weather cumulus on a summer day makes a wholly different impression from that given by a stratus cloud sheet covering an equal portion of the sky.

Cloudiness as a Climatic Element

The amount of cloudiness is recorded by eye on a scale of 0 (cloudless) to 10 (overcast), and the conventional climatic summary includes the mean annual and mean monthly amounts of cloudiness, expressed in tenths or

* This is the fifth in a series of articles by the present writer on the climatology of the United States. The four previous articles were: Climatic Subdivisions of the United States, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 672-680; Rainfall Types of the United States, *Geogr. Rev.*, Vol. 4, 1917, pp. 131-144; Rainy Days and Rain Probability in the United States, *ibid.*, Vol. 7, 1919, pp. 44-48; Frost in the United States, *ibid.*, Vol. 7, 1919, pp. 339-344.

percentages. These means, while giving the larger facts which are quite sufficient in general climatic descriptions, do not furnish as vivid a picture of the nature and of the variations of cloudiness as is often desired in detailed studies of local climates. For such investigations, information regarding the average numbers of clear, partly cloudy, and cloudy days in each month should be included. This gives a more complete picture of the actual distribution of cloud and sunshine than do the monthly and annual means. It shows what kinds of days prevail throughout the year.[1] Further, if three observations of cloudiness are taken daily, it is very desirable to have the means for the morning, afternoon, and evening hours

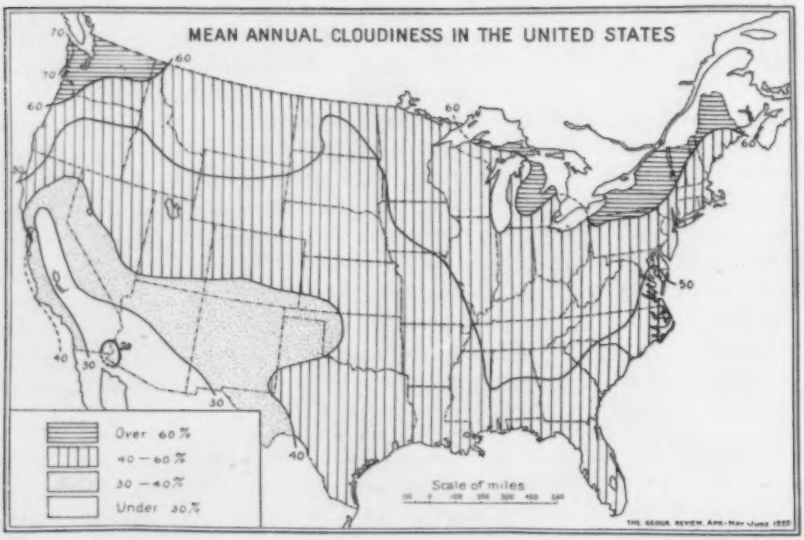
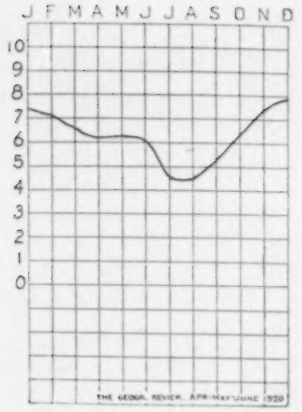


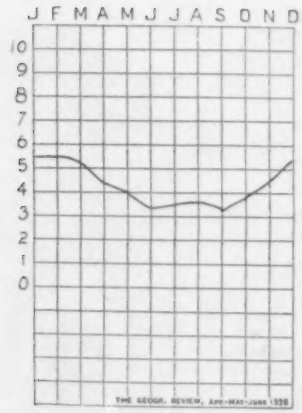
FIG. 1—Map showing mean annual cloudiness in the United States. Scale 1: 45,000,000.

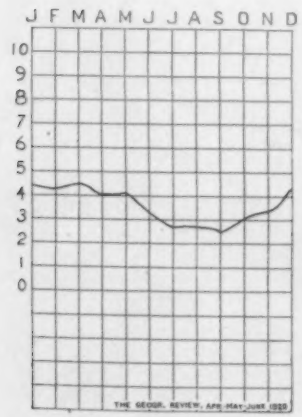
given separately. In this way the diurnal variation of cloudiness can be readily seen. Two places may have exactly the same mean monthly cloudiness with quite a different diurnal distribution in the two cases. One of them, for example, may have prevailingly overcast skies in the mornings and evenings, with cloudless noon hours, while the other is partly cloudy all day. The economic and physiological effects of the two climates may differ greatly.

In a broad view of the climates of an extended area, like that of the United States, it is sufficient if the larger facts of annual and monthly

[1] Observations covering this aspect of cloudiness are regularly published by the U. S. Weather Bureau in the *Climatological Data* of the various sections, the *Monthly Weather Review*, and the *Annual Reports of the Chief of the Weather Bureau*.







FIGS 2-17—Diagrams showing, month by month, the annual variation of cloudiness in the different climatic provinces of the United States.

FIG. 2—North Pacific coast (annual mean, 6.3).
FIG. 3—Middle Pacific coast (annual mean, 4.4).
FIG. 4—South Pacific coast (annual mean, 3.6).

amounts of cloud are known. Details may easily be looked up if they are desired.

THE AVAILABLE CLOUDINESS MAPS OF THE UNITED STATES

The first monthly and annual cloudiness maps for the United States were included in Teisserene de Bort's isonephs[2] for the world (1884) and were necessarily based on very incomplete data.[3]

The first complete set of monthly cloud maps for the United States alone was published by General A. W. Greely, then Chief Signal Officer, in 1891.[4]

The first map of mean annual cloudiness for the United States alone was that published in the *Annual Report of the Chief of the Weather Bureau for 1896-97*.[5]

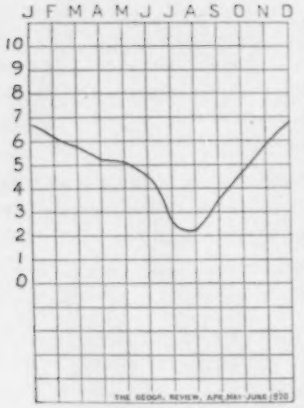
A new series of maps, both monthly and annual, appeared in 1911. These were constructed by Kenneth McR. Clark, then a

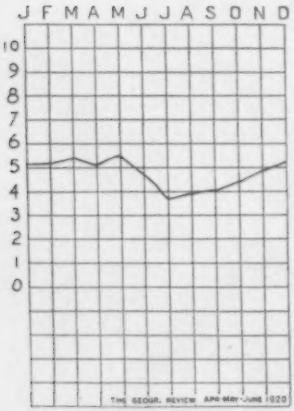
[2] Lines of equal cloudiness.

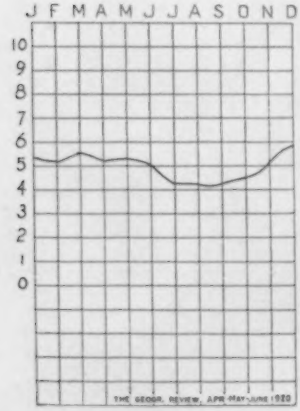
[3] Léon Teisserenc de Bort: Etude sur la distribution moyenne de la nebulosité à la surface du globe d'après les premières cartes d'isonephes. *Annales Bur. Central Météorol. de France*, Vol. 4, 1884. The data for the United States were those for 96 stations, for the period 1843-1854, originally published in the *Army Meteorological Register*. These maps are reproduced, in colors, in the "Atlas of Meteorology," 1899, Pls. 17 and 18, text, p. 16, the annual map for the United States having been revised by the incorporation of more recent data included in the *Annual Report of the Chief of the Weather Bureau for 1896-97*.

[4] A. W. Greely: Charts Showing the Average Monthly Cloudiness for the United States, folio, U. S. Signal Service, Washington, D. C., 1891. These maps were based on recent data collected by the Signal Service. The longest period covered by the observations was 18 years (1871-1888), and many of the 143 stations had shorter records. A discussion of the facts brought out on General Greely's maps was later published by Köppen (W. Köppen: Regenwahrscheinlichkeit und Bewölkung in den Vereinigten Staaten von Nordamerika. *Meteorol. Zeitschr.*, Vol. 10, 1893, pp. 161-168), who also constructed a series of diagrams showing the annual variation of cloudiness for latitudes 32°, 40°, and 47° N., for longitudes 87° and 97° W., and for the Atlantic and Pacific coasts.

[5] Part VI, Chart XX, text, pp. 286-287, Washington, D. C., 1898







student in Harvard University.[6]

In 1912 another and still more complete set of maps and diagrams, prepared by Gläser, was published.[7] There are thus already available two recent sets of monthly and annual cloud maps, those of Clark and of Gläser. The latter are based on somewhat more complete data than the former, and the isonephs are drawn with more attention to details. In their broad general features the two sets of maps are essentially similar. Neither series is fully up to date, but it is unlikely that the addition of newer data would lead to any important modifications in the locations of the monthly isonephs already drawn.[8]

The Present Cloudiness Map of the United States

The accompanying new map of mean annual cloudiness (Fig. 1), here published for

FIG. 5 – Northern Plateau Province (annual mean, 5.0)

FIG. 6 – Northwestern Plains Province (annual mean, 4.8)

FIG. 7 – Upper Mississippi Valley (annual mean, 5.0).

[6] K. McR. Clark: A New Set of Cloudiness Charts for the United States, *Quart. Journ. Royal Meteorol. Soc.*, Vol. 37, 1911, pp. 169-175. Observations were used from 77 stations with records for 30 or more years; 31 with less than 10 years, and 15 with 5 years or less. The isonephs were intentionally generalized so as to bring out only the larger facts.

[7] Arthur Gläser: Bewölkungsverhältnisse und Sonnenscheindauer von Nordamerika, *Aus dem Archiv der Deutschen Seewarte* (Hamburg), Vol. 35, 1912, No. 1, pp. 1-63. This is the most complete discussion of the cloudiness and sunshine of the United States up to the present time. General Greely's maps have been revised by the inclusion of newer and more complete data covering the year 1906, 236 stations in all being used. There are maps showing annual, seasonal, and monthly isonephs; the annual range in cloudiness; seasons of maximum and of minimum cloudiness; and isopleths for latitudes 32°, 40°, and 47° N., for longitudes 80°, 90°, 100°, and 110° W., and for the Atlantic and Pacific coasts.

[8] For further brief discussions of cloudiness in the United States see: A.W. Greely: American Weather, New York, 1888, pp. 64-68 (gives maps of mean cloudiness for January and August on the basis of observations for 1871-86; also curves showing the annual fluctuations of cloudiness at selected stations); Frank Waldo: Elementary Meteorology, New York, 1896, pp. 352-354 (reproduces General Greely's maps for January and August); Julius von Hann: Handbuch der Klimatologie, 3d edit., Stuttgart, 1911, Vol. 3, pp. 390-391; F. L. Wachenheim: Die Hydrometeore des gemässigten Nordamerika, *Meteorol. Zeitschr.*, Vol. 22, 1905, pp. 193-211 (with monthly percentages for selected districts).

the first time, was drawn by the present writer on the basis of the latest and most complete data now available. These data were supplied by the courtesy of the Weather Bureau. They include all the regular Weather Bureau stations having a length of record sufficient to justify the preparation of the mean values. The total number of stations employed was about 190. Of these, 65 had over forty years of observations; nearly 40 had between thirty and forty years; 30 had from twenty to thirty years; 40 from ten to twenty; and the remainder ten years or less. The last year included in the means was 1918. In drawing the isonephs somewhat greater weight was laid on the data for stations with

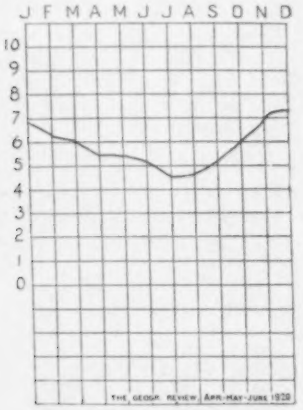


FIG. 8.—Upper Great Lakes (annual mean, 5.8).

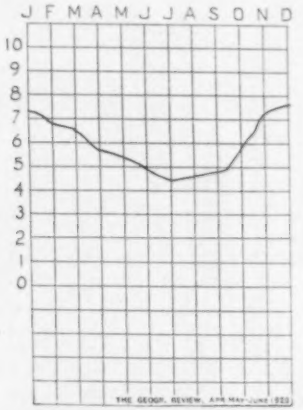


FIG. 9.—Lower Great Lakes (annual mean, 6.0).

the longer periods of observations. In dealing with the element of cloudiness, however, the amounts of which are estimated by eye, perfect accuracy is obviously impossible of attainment. It appears on investigation that short-period means do not depart to any considerable degree from long-period means. Indeed, the departures are probably no greater than the differences resulting from the personal equation in the case of different observers. It is, therefore, unnecessary to reduce the means of cloudiness to the same period of time, as is done in the case of instrumental records. Furthermore, the short-period records are by no means to be disregarded as altogether unreliable. The accompanying map is intentionally generalized. It is designed to present the larger facts in the distribution of the mean annual cloudiness and not to emphasize details. The isonephs were first drawn on a large-scale map with careful attention to the actual data. They were then transferred to a small-scale map and smoothed. In several cases in which a single station shows a slightly greater or smaller amount of cloudiness than the surrounding sections, that station was deliberately

omitted in order not to overemphasize local conditions.[9] In drawing isonephs for as large an area as that of the United States, with the relatively small number of stations for which records are available, a good deal must be left to the individual judgment of the investigator and to his desire to present either a more detailed, or a more broadly generalized, picture.

Mean Annual Cloudiness

If details are omitted and only the larger facts are kept in view, the general distribution of cloudiness for the year is easily described and remembered. There are two districts of maximum cloudiness (over 60 per cent): one lying over most of the Great Lakes region and extending northeastward over the St. Lawrence valley and northern New England, the other found on the extreme northwestern Pacific coast. Both of these sections are under marked cyclonic control, especially in the colder months. In both cases the prevailing winds in general blow across bodies of water. On the Pacific slope the presence of mountains close to the coast is an additional factor in causing condensation. It is significant that in this last-named section the areas of maximum cloudiness and of maximum rainfall correspond closely. The southwestern portion of the Plateau Province[10] (between the Rocky Mountains and the Sierra Nevada) is the least cloudy section of the country. Southern Arizona and the central and southeastern parts of California have less than 30 per cent. A smaller area centered around Yuma, Ariz., has less than 20 per cent. The sunny skies of the Southwest are easily explained. Few general storms frequent that part of the country, and it is well shut off from moisture-bearing winds. In going eastward from the Southern California coast into the desert there is a marked and rapid decrease in cloudiness.

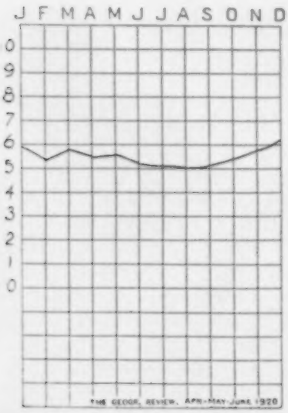


Fig. 10—New England (annual mean, 5.5).

In general, the eastern half of the country has more, and the western half, except on the North Pacific coast, less than 50 per cent. The

[9] For example, in the Appalachian area, in an extended region having as a whole between 50 and 60 per cent, Elkins, W. Va., with a 20-year record, has 63 per cent; Wytheville, Va. (16 years), has 46 per cent; Reading, Pa. (6 years), has 60 per cent; Harrisburg, Pa. (30 years), has 56 per cent. Walla Walla, Wash. (31 years), has 50 per cent, and Havre, No. Dak. (36 years), has 49 per cent in a general area having between 50 and 60 per cent. Green Bay, Wis. (32 years), has 64 per cent in a general area with 50 to 60 per cent. There are a few other cases which have similarly been omitted.

[10] One of the climatic provinces into which the author has divided the United States. See R. DeC. Ward: Climatic Subdivisions of the United States. *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 672-680, especially map on p. 678.—Edit. Note.

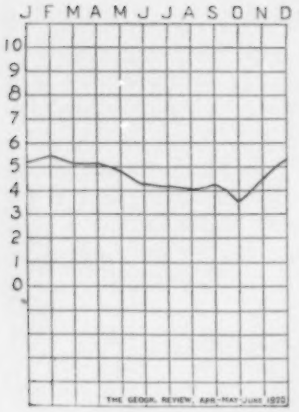
Northern States are more cloudy than the Southern, as is to be expected from the more active and more frequent storm control in the north. This difference is well marked on the Pacific coast and over the plateau; it is less so in the East. The Pacific coast as a whole is less cloudy than the Atlantic, but the northern part of the Pacific coast is more cloudy than any portion of the Atlantic. Over thirty years ago Woeikof called attention to the fact that, although the available data on cloudiness for the eastern United States were then scattering and unsatisfactory, it was already certain that the mean annual cloudiness is less here than in Europe, excepting in the Mediterranean area.[11]

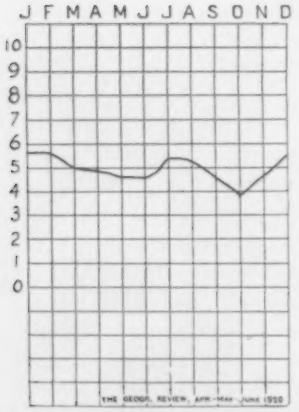
Seasonal Variations in Cloudiness

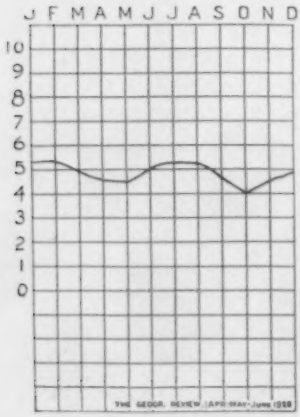
The mean annual amount of cloudiness, the distribution of which has just been considered, is the result of the interaction of all the cloud-producing conditions working together throughout the year. As these conditions vary more or less in the different months, the average percentage of cloudiness for the whole year gives a very inadequate, and not infrequently quite a misleading, impression of the state of the sky as this is actually seen from day to day and from month to month. If the monthly maps of isonephs are examined, a general but somewhat irregular seasonal migration of the lines of equal cloudiness becomes apparent. Taking the country as a whole, winter is the cloudiest and summer the clearest season. Roughly, from midsummer to early winter there is an equatorward movement of the belt of maximum cloudiness, and from midwinter to summer there is a general northward retreat. This seasonal movement of the isonephs is associated with the corresponding equatorward and poleward migration of the general storm belt, and the latter, in turn, depends upon the seasonal changes of temperature. In winter general storms are more frequent, better developed, and affect larger sections of the country. This involves the development of more frequent and more extended cloud sheets. Furthermore, during the colder months, winds which blow from warm waters naturally tend to become cloudy and rainy as they pass over the colder land to leeward. During the winter the Great Lakes and the North Pacific coast have a mean monthly cloudiness of more than 70 per cent and even of more than 80 per cent over smaller areas. The lee shores of the Great Lakes are more cloudy than those to windward. In summer, these same sections (Great Lakes and North Pacific coast) have, in general, about 50 per cent or less. An exception is a narrow strip on the coast of Washington, which even in summer maintains a mean cloudiness of over 60 per cent.

In the Southwest, the area of minimum cloudiness shows a gradual expansion northward and eastward as the season advances. The 30 per

[11] Alexander Woeikof: Die Klimate der Erde, 2 vols., Jena, 1887; reference in Vol. 2, p. 45.





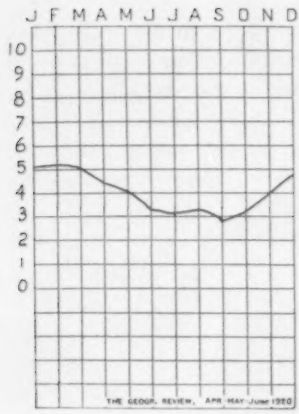


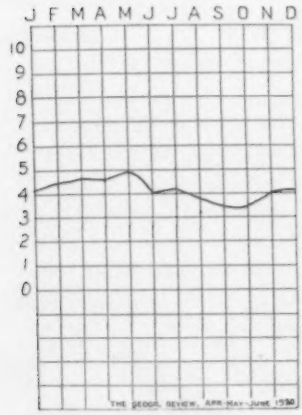
cent isoneph, which encloses a relatively small area in the extreme southwestern interior in winter, covers most of the interior Plateau Province by midsummer, when the 20 per cent and 10 per cent lines, which do not appear at all on the winter maps, enclose considerable portions of that same district.

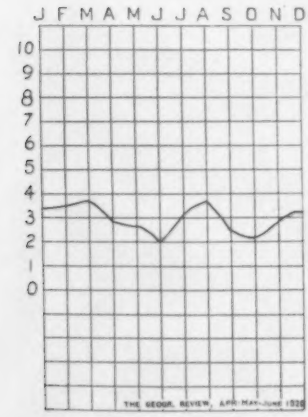
There are certain exceptions to the general rule, above stated, that the winter is the cloudiest and the summer the clearest season. The Pacific coast distinctly shows the contrast between the cloudier skies of its winter and the summer skies of its summer and early fall. Figures 2, 3, and 4 show the characteristic seasonal distribution of cloudiness on the Pacific coast and also the gradual decrease in the amount of cloud from north to south. There the season of rain and the season of maximum cloudiness go closely hand in hand.[12] In the Valley of California the midsummer months are indeed almost cloudless as well as rainless, thus providing most favorable conditions for many outdoor occupations such, for example, as the sun-drying of raisins. Over the northern tier of states as a whole, from the Pacific to the Atlantic, July and August (or September) are the least cloudy months. Figures 5 to 9 illustrate the annual variation of cloudiness over the northern tier of states from the northern Plateau Province eastward to the lower Great Lakes. New England (Fig. 10) has very little variation in cloudiness through the year. The southern tier of states, on the other hand, with a few exceptions, has its minimum cloudiness in autumn, October being quite generally the least cloudy month (Figs. 11-13). These autumn months are a transition season, before

FIG. 11—West Gulf States (annual mean, 4.7).
FIG. 12—East Gulf States (annual mean, 5.0).
FIG. 13—South Atlantic States (annual mean, 4.8).

[12] In these and the following figures the curve showing the annual variation of cloudiness is based on the mean monthly cloudiness as determined by combining the data for a group of stations in that particular section. The curves are therefore composites.







the winter storm control sets in, and are also a time of minimum rainfall over a considerable portion of the eastern United States.

The winter (December-February) maximum of cloudiness is characteristic of the Pacific slope (Figs. 2-4), the Plateau (Figs. 5 and 14), and all of the southern and eastern United States excepting Florida. The northernmost tier of states east of the Great Plains, including most of the upper Great Lakes region and New England, has its maximum in late autumn or early winter (Figs. 8-10). Middle or late spring is the cloudiest season over the northern Great Plains, when the rainfall maximum of that section is already well marked (Figs. 6 and 15), while the middle and late summer convectional rains of the southern Plateau, with prevailing southerly winds, give a maximum, or at least a secondary maximum, there in July and August (Fig. 16). In Florida, also, the summer months with their heavy rainfalls are the cloudiest season (Fig. 17).

Annual Variation in Cloudiness

Over most of the country the difference between the amount of cloud in the cloudiest and in the least cloudy months is so small (generally 10-20 per cent) as to be of no special significance. In the two districts of maximum annual cloudiness, the Great Lakes and the North Pacific coast, there is a greater difference (30 per cent or more) between the percentages of cloudiness at the times of maximum and minimum. The western Plateau also has a marked contrast (30-40 per cent and over) between its cloudy and its clear seasons. The summers are there very sunny, while the winter storms, passing over this district from the Pacific, cause a fair amount of cloudiness. Woeikof seems to have been the

Fig. 14—Middle Plateau Province (annual mean, 4.0).
Fig. 15—Central Plains Province (annual mean, 4.1).
Fig. 16—Southern Plateau Province (annual mean, 3.0).

first to point out that the annual variation in cloudiness in the central and eastern portions of the United States is less than that in Europe;[13] and von Hann has called attention to the fact that there is no such well-marked annual variation in the eastern United States as there is in eastern Asia.[14] The reason is found in the frequency of damp, easterly cyclonic winds during the American winters, while in eastern Asia the dry offshore northwesterly winds are the dominant winter characteristic and give clear skies.

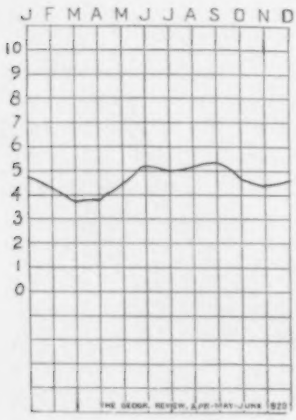


FIG. 17—Florida Peninsula (annual mean, 4.6).

RELATION OF CLOUDINESS TO RAINFALL

Another matter which also deserves mention here was emphasized by General Greely in his discussion of his monthly cloudiness maps.[15] The annual amounts of rainfall and of cloudiness show no fairly fixed ratio, as might at first thought be expected. In comparing the southern Great Plains and their relatively small amount of cloud with the cloudier and rainier Great Lakes region, cloudiness and rainfall may seem somewhat closely related. In going east from the northern Great Plains to the Great Lakes, on the other hand, the rainfall doubles while there is no correspondingly marked increase in the amount of cloud; and the northern Gulf Province has about four times the rainfall of New Mexico, while the cloudiness in the former district is not even double that in the latter.

[13] Woeikof, *loc. cit.*
[14] Julius von Hann, *loc. cit.*
[15] A. W. Greely, work cited in footnote 4.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Meetings of April. The last meetings of the American Geographical Society for the season of 1919-20 were held on April 6 and April 20 at the Engineering Societies' Building, 29 West Thirty-ninth Street. At both meetings President Greenough presided. At the semi-monthly meeting on April 6 the Charles P. Daly Medal of the Society was presented to Dr. George Otis Smith, director of the U. S. Geological Survey. An account of the presentation, and of Dr. Smith's address on "The Geographic Side of Geology" which followed, is given immediately below. On April 20 a monthly meeting was held, at which President Greenough submitted the names of 14 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Dr. Edgar J. Banks, late field director of the Babylonian expedition of the University of Chicago, delivered an address entitled "A Thousand Miles Down the Tigris River."

Presentation of the Charles P. Daly Medal to Dr. George Otis Smith. At the semi-monthly meeting of the American Geographical Society on April 6, at the Engineering Societies' Building, 29 West Thirty-ninth Street, the Charles P. Daly Medal of the Society was presented to Dr. George Otis Smith, director of the U. S. Geological Survey. In presenting the medal, President Greenough, who presided at the meeting, spoke as follows:

"The foundation of the medal, which as your President I am about to present, prescribes that it shall be bestowed for contribution to geographical science, and it is most suitably awarded to our guest in the present instance. The fervent political atmosphere which surrounds the executive offices of our Washington Government tends to obscure from the general public the valuable and original scientific work which is constantly performed by various auxiliary departments whose function, roughly speaking, is the acquisition of knowledge pertaining to the conditions and needs of the people of the United States and its adaptation to their use in practical affairs. Amongst the chief of these important agencies is the bureau known for forty years as the U. S. Geological Survey, of which our guest has been for many years the administrative head under the title of Director.

"The official designation of the bureau gives a very inadequate impression of the character and extent of the service rendered by it to the nation in its conception of its duties, which are defined as the 'examination of the geological structure, mineral resources, and products of the national domain.' It is not easy to grasp the magnitude of such an undertaking as applied to an area so great and varied as the United States, covering more than 3,000,000 square miles of territory. It involves the topographical survey and mapping of the field, the ascertainment in detail of quantity and character of minerals and other geological deposits, the ascertainment of water supply and power, the publication and adaptation of its investigations for use by the departments of the government and by the public, besides statistical compilations and research in many directions too numerous to enumerate here. My desire is only to outline the extent and value of the contribution thus made to scientific knowledge.

"But I may especially record the patriotic and vital part taken by the Survey in the prosecution of the war. Its honor roll numbers 477, and the work of its geologists, its topographers, its hydraulic engineers, and its statisticians found opportunity for invaluable aid to the armies at the front in the various spheres indicated by those titles, which services were acknowledged by citation and decorations by the French authorities as well as our own.

"The organization and control of the vast and complex mechanism which I have attempted to indicate devolved primarily upon its Director, who is justly entitled to the first place in the allocation of honor for its achievement. But he would be the readiest to disclaim an exclusive right to credit for results attained by the concerted action of his associates, and I may be permitted to join with his name a public recognition of the work done by Lieutenant-Colonel A. H. Brooks, Lieutenant-Colonel R. B. Marshall, Lieutenant-Colonel Birdseye, Lieutenant-Colonel Glenn Smith, Major J. W. Bagley, Dr. J. B. Umpleby, and Dr. E. S. Bastin in the organization of departments

of work of special importance to the nation, at home and in France, in addition to Major L. L. Lee, Major J. H. Wheat, Captain A. T. Fowler, and Lieutenant Mudd, and many others, including topographers and geologists who rendered distinguished service in the field.

"With the cessation of the war the Survey was amongst the first to readjust itself fully to the discharge of its useful function in time of peace. The enormous accession to the industrial development of our country will make increased demand upon its facilities, and the nation will regard with confidence and pride the conduct of this great bureau under the management of its accomplished Director.

"And now, Sir, on behalf of the Society I ask your acceptance of this medal, which is inscribed as follows:

TO
GEORGE OTIS SMITH
DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY
HE HELPED DISCLOSE AND DEVELOP THE
NATURAL RESOURCES OF HIS COUNTRY
ADAPTING THEM TO ITS SERVICE IN PEACE AND WAR
1920

"Upon this record of distinguished effort and successful achievement—the aim of all human endeavor—I beg to offer the congratulations of the Society and its earnest good wishes for your future health and prosperity."

In accepting the medal, Dr. Smith spoke as follows:

"Recognition of service rendered is always acceptable. Especially am I pleased, President Greenough, that by your mention of my associates you have called attention to the fact that the best public service is truly democratic. The work of a great Federal bureau is not only for the many, it is by the many. Representing here the U. S. Geological Survey, I feel that the honor your society has accorded me is the greater because it has been won by united effort.

"The service flag that hangs behind my desk at Washington is a reminder of the 477 men who wore the uniform of the Army or Navy and whom you just now mentioned as constituting the Survey's roll of honor; and we are proud, too, of the score of citations and decorations won overseas by these technically trained officers, including three French crosses for exceptional bravery at the front. But, Sir, there were hundreds of other members of the U. S. Geological Survey who rendered equally needed service in their civilian capacity; indeed there were scores of our best men who preferred overseas service but were commandeered for office or field work as civilians here in the United States. That type of sacrifice also helped win the war.

"It is, Mr. President, in behalf of all these, my associates, that I express my deep appreciation of this honor, and in accepting the Charles P. Daly Medal of the American Geographical Society I assure you that the work for which the award is made is still in progress. I trust, moreover, that our contributions to geographic science may increase in scope and value in the years to follow. And so I thank you, Sir, for this added incentive to future service."

Dr. Smith's Address

There followed an address by Dr. Smith entitled "The Geographic Side of Geology", which is abstracted as follows:

The distinction between the two sciences of geology and geography, which have so much in common as regards scope, method, and personnel, can perhaps be best expressed in terms of their space relations. Geography in this sense is a two-dimensional science; geology adds the third dimension, for it looks beneath the surface of the earth, and its attention to the past and its regard for the future might justify a claim to a fourth dimension—time. It follows that geography becomes the limiting upper plane, along which most men find their only contact with geology, while the fourth, or time, dimension of geology transcends the length and breadth of this plane. This illustration may serve to exhibit the phase of geology which I wish to discuss, its geographic side.

Since the period of Government surveys terminated by the Civil War, the trend of geology has been decidedly toward the practical. The work of the U. S. Geological Survey, with the attention given by its field service to the search for water, ore, coal, and oil, has brought the science into closer touch with the industrial life of the people. The emphasis has been put on resources and use, and the phase of the science which has been most developed under both governmental and educational auspices is economic geology.

The distribution of mineral resources stands out as the geographic phase of applied geology and leads directly to questions of utilization. The value of ores is determined in part by locality and is dependent upon facts of transportation. Thus, in the inventory of mineral resources necessitated by the outbreak of the war, the emphasis was immediately put upon the geographic facts of locality and accessibility, while economy of transportation became the test of value in the examination of ore deposits.

The study of national resources for use in the war program led also to the development of the international view of mineral resources and the industry and commerce founded upon them, and a specialized type of geology, its application in terms of commerce, was demanded. The worker in this field needs to interpret his facts of ore occurrence in terms of use and value to mankind. Ore deposits thus take on competitive relations, which depend in turn upon geographic facts of distribution—not only the location of the ore, but its distance from the supplies of fuel, power, and labor required, as well as the available markets. The scientist must thus relate the facts of his science to national life, and it is this human application of geology which is also its geographic side.

Under the stimulus of the war demand, the work of the Survey in commercial geology took form in the preparation of a world atlas. In order to make the collected data useful to the citizens of the United States, this atlas is now being prepared for publication. The "Atlas of Commercial Geology" will exhibit graphically the distribution of mineral production and mineral reserves, and the necessary world view will be supplied by mineral maps of every continent, while the basal facts of commercial geology and their application to the problems of industry will be presented in a form available for use by the business man. In this connection, also, there has been established in the Survey an "open file" of mineral information for use by geologists and engineers. The first part of the atlas presents the distribution of mineral output in 1913 and is a record of the past, though the figures for that normal year express in a rough way the relative wealth of the leading nations in the essential minerals. The chief importance of the atlas, however, will be found in those parts which show the mineral reserves, though even here our knowledge must be subject to discount in view of the changes in transportation facilities, degree of industrial development, and market requirements, all of which are vital factors in the estimate of the value of mineral reserves.

A comparison of the continents as sources of mineral commodities in 1913 clearly demonstrates the dominance of Europe and America, and, if this comparison is expressed in terms of market value, America's industrial leadership becomes apparent. However, if we would add guarantees of permanence to present prosperity, American industry, in meeting the worldwide competition of the future, must benefit from the lessons learned during the war. There must be a full understanding of America's industrial dependence upon mineral resources, together with a regard for adequacy and permanence of supply, no less than for cost, while the war-time standard of utility as the measure of the value of mineral commodities should be retained. We must realize that resources are expendible, while industry is long-lived, and that commerce on a right basis is the equalizer of supply and demand.

Though America is in the highest degree self-sufficient, two main reasons demand our adoption of an international viewpoint of mineral resources: Our wealth carries its international responsibilities, and our future domestic independence is by no means certain. A striking illustration of this latter fact is afforded by the current statistics of the domestic oil supply, showing an increase in demand far exceeding production, a situation which has enlisted the active interest of American capital in the search for supplies of petroleum abroad. The establishment of foreign trade relations and the domestic industrial expansion resulting from the development of foreign mineral resources serve to emphasize the obvious connection between industry and commerce.

The preponderance of the fuel supply of the world assures to the northern hemisphere, and especially to the countries bordering the North Atlantic Basin, the possession of the centers of industry for centuries to come, an important factor in the political geography of the future. In the solution of the current problems of national policy in the fields of industry and commerce, a knowledge of the facts of commercial geology is necessary. This world outlook is essential, and yet the geographic center of our study must always be the United States, and our consideration of world resources should be related to our own national interest. A wise provision for an adequate supply of mineral raw materials, as well as regard for domestic industrial development, must be the safeguard of the future security of our industrial program. These principles represent the human side of mineral resources and the American side of commercial geology.

Notice Concerning the Current Volume of the "Geographical Review." The present number of the *Geographical Review*, covering the months of April, May, and June, completes Volume IX. The title page, table of contents, and index for this volume will be issued separately. A copy will be sent to each institution exchanging publications with the Society and, on request, to any one who desires to receive one.

The Society's supply of the February, 1920, number of the *Geographical Review* is exhausted. Fellows and others will confer a favor by returning to the Society any copies of this issue they may not care to keep.

EUROPE

A Notable Atlas of Population Distribution in Sweden. For some years Professor Sten De Geer of the University of Stockholm has been experimenting with methods of graphically representing the distribution of population. He has followed the wise plan of writing experimental articles and inviting criticism (Sten De Geer: Befolkningens fördelning på Gottland, *Ymer*, Vol. 28, 1908, pp. 240-253, with map, 1:300,000; Per Stolpe: Till frågan om Gottlands befolkningsfördelning, *ibid.*, Vol. 28, 1908, pp. 413-419; Sten De Geer: Storstäderna vid östersjön, *ibid.*, Vol. 32, 1912, pp. 41-87, with plate of 12 Baltic city plans, 1:100,000; Alfred Söderlund: Förslag till intensitetsbeteckning vid konstruktion av täthetskartor, *ibid.*, Vol. 35, 1915, pp. 267-272; G. A. Larsson: Intensitetsbeteckningar vid kartografisk framställning av befolkningsfördelningen i tätare bebyggda trakter, *ibid.*, Vol. 35, 1915, pp. 351-363).

He has thus perfected a method which is well-nigh ideal, and which has been employed in a beautiful atlas showing the distribution of population in Sweden, according to the census of January 1, 1917 (Karta över befolkningens fördelning i Sverige den 1 januari 1917. Med statsbidrag utgiven av Sten De Geer. 1:500,000. 12 plates in atlas, 22½ x 16 inches. Stockholm, [1919]). A small black dot indicates a hundred people. Villages or small towns up to a population of ten thousand are indicated by the appropriate number of dots placed where the people live in the country or arranged in rectangles to represent towns. For larger places he has evolved a symbol which is admirable because of the conspicuous way in which it stands out. The symbol is merely a small sphere shaded so as to stand out plastically. Besides this is placed a red figure showing the population in hundreds. Several sizes of spheres indicate the relative importance of the cities. The central sphere of Stockholm, surrounded by 12 satellites and by a great number of small black dots, is particularly interesting.

The atlas is accompanied by an explanatory text (Befolkningens fördelning i Sverige: Beskrivning till karta i skalan 1:500,000 av Sten De Geer; 296 pp., Stockholm, 1919). This is in Swedish, but at the end there is an English explanation of the signs used on the maps. The atlas shows not only the distribution of population, but the degree of cultivation, the limits of certain main types of prevalent industries, the lines of communication graded according to their importance, a large number of "lines of physical geography," and certain administrative and other boundaries. Topography, forests, geological structure, and the drainage basins of rivers are all indicated, as well as boundaries of fishing areas. So skillfully is this done that there is no confusion and the maps are easy to read even in the most crowded portions. The scale, 1:500,000, has obviously been chosen with the needs of the more densely populated regions in mind, for in the sparsely populated north it leaves great areas almost blank.

This atlas, taken in conjunction with the atlas illustrating the Swedish agricultural census of 1900 (Sveriges jordbruk vid 1900 talets början: Statistiskt kartverk utarbetadt af Wilhelm Flach, H. J. Dannfelt, Gustav Sundbärg, 262 pp., Göteborg, 1909), places Sweden well in advance of any other country in the skill and accuracy with which it has been mapped. While other countries may excel Sweden in large-scale maps of small areas, no other boasts an atlas which gives so comprehensive and accurate an idea of the life of the people. It is a pity that the United States cannot rival Sweden.

The lead of the Scandinavians in these matters is shown by the fact that a similar atlas on Norway is now in preparation by Mr. Söderlund, one of Professor De Geer's students, in collaboration with Norwegian authorities. The Swedish geographers in Finland are also considering a similar map of that country. The geographers in those countries wonder why Americans do not do a similar piece of work. As Professor De Geer puts it in a personal letter: "When I consider the 'power of initiative' of American geographers and their strong demand for clearness and sense for practical use, I hope that they will accomplish a gigantic map of American population perhaps as soon as we shall have a complete map of Northern Europe or at least of the Fenno-Scandian natural region."

ELLSWORTH HUNTINGTON

ASIA

The Climate and Weather of Mesopotamia. British occupation of Mesopotamia has already been productive of important scientific work. A report on the "Climate and Weather of 'Iraq" (printed and published in Bagdad in 1919), by Lieutenant C. W. B. Normand, gives a very clear and graphic description of the essential meteorological and climatic characteristics of a region the ancient historical interest in which has been renewed by the consequences of the late war. The term Irak applies to the flat alluvial plain lying between Bagdad and the Persian Gulf and is identical in its boundaries with the ancient land of Shinar, the home of the Babylonians. Without its two master rivers, the Tigris and the Euphrates, Irak would be almost a barren desert. When this land was watered by the Babylonian canal system, it was the richest country of Asia and the earliest center of civilization. Without a very perfect system of "river training," marshes are bound to occur along the lower courses of the rivers, which at all times have silted up one channel after another and at intervals have spread disastrous floods over the land. The story of Noah's flood is associated with the earliest history of the region. The probability is "that the Deluge, of which memory is preserved in the legend, was brought down by the rivers and followed a remarkably rainy month in the plains, when copious rain must also have fallen amongst the hills at the headwaters of the rivers."

The climate of Irak is "continental subtropical," i. e. it has large diurnal and annual ranges of temperature, a small vapor content, and scanty rainfall. A moderate estimate gives an annual evaporation of 10 feet, while the rainfall just exceeds half a foot. A small area only is at present productive, through irrigation. The prevailing condition is that of an almost barren wilderness, with scattering camel-thorn and with thin patches of herbage in spring. There are two main seasons. Practically all the rain falls in "winter," from November to April. The rest of the year is marked by oppressive heat and an almost complete absence of rain.

During the winter the main weather control is exercised by a succession of cyclonic depressions, of which there are three or four a month, coming from the eastern Mediterranean or Asia Minor. On the whole the conditions during the six cooler months are pleasant and invigorating. Most of the days are clear or only partly cloudy; the nights are chilly; severe frosts occasionally occur in the early mornings.

In the transition period (March to May) the temperature rises rapidly; the rainfall becomes more and more of the thunderstorm or squall type; flies and other insects are a source of discomfort.

During the hot weather the prevailing winds are northerly, under the control of the great low-pressure system over southern Persia, Baluchistan, and northwestern India. These winds are dry and hot. There is neither rain nor cloud. "To the city inhabitants the hot weather is a period of existence in thick-walled and even underground rooms by day, and on the roof by night." Some relief is found in the *shamal*, a high northwest wind of 20 to 40 miles an hour which blows for periods of several days at a time in June, July, and August. The *shamal*, while often dusty and disagreeable, brings some alleviation from the oppressive heat by lowering the day temperatures and acting as a natural and efficient punkah. In the opinion of most people who have had experience in both climates, Irak is to be preferred to northern India in summer, for in the former region the nights are less unpleasant, there is usually a breeze, and conditions are more favorable for sleeping.

Lieutenant Normand is emphatic in his opinion that climate has not changed in Babylonia. "There exists neither historical nor geological evidence to indicate any appreciable change of climate within historical times beyond the local changes due to a general system of irrigation and the more northerly position of the seaward end of the delta. . . . Throughout history there are evidences of the liability of the rivers to sudden floods, and according to Willcocks, the water supply of the rivers was inadequate in those days, as at present, for the irrigation of the whole of the irrigable land. The general archeological view, indeed, is that the climate has undergone no appreciable change since the days of the Babylonian Empire."

This report deals mainly with Irak, but numerous tabulated observations from the neighboring submontane and mountain districts, and also from the Persian Gulf, are included because of the meteorological interdependence of all these regions.

R. DEC. WARD

POLAR REGIONS

A Recent Drift in the Kara Sea. A remarkable drift voyage has recently taken place in the Kara Sea. On January 22, 1920, the Russian icebreaker *Solovye Budomiro-*

vich (2500 tons burden; equipped with wireless) left Archangel, making for Cheskaya Guba, the large bay east of the White Sea. The aim of this winter journey was to load a complete cargo of reindeer meat on this coast, frequented by Samoyeds. The crew and passengers, including five women, numbered 85. Three days later, off the White Sea, before entering Cheskaya Guba, the ship was beset and then drifted in a generally easterly direction. Always locked in the pack, she was driven through Kara Strait and entered the Kara Sea, where she pursued her drift in a zigzag course. The current first drove the vessel northeast and soon after southeast. Then followed a drift almost due east and subsequently north-northwest. According to wireless messages received from the Russian icebreaker, her successive positions to April 20 were found to be as follows:

March	23	72°	39′	N.	lat.	62°	9′ E. long.
April	6	71°	5′	"	"	62°	8′ " "
April	14	71°	4′	"	"	64°	27′ " "
April	20	72°	8′	"	"	63°	43′ " "

As soon as a wireless message from the *Solovye Budomirovich* telling of her dangerous position—there was then no more coal on board and food was scant—was received by the Archangel station, the Russian Soviet government called by wireless on the Norwegian government to rescue the ship in distress, insisting on the humanitarian purpose of such an enterprise. The Norwegian government agreed, and a rescue expedition was organized. No strong ship being available in Norway, the British government loaned a powerful icebreaker, the *Sviatogor*, and Captain Otto Sverdrup, the celebrated Polar explorer, volunteered as leader of the expedition. Dr. Breitfuss, the well-known Russian oceanographer, was a member of the staff. The expedition was provided with two airplanes for detecting the position of the distressed ship. The *Sviatogor* left Bergen on May 12 for the Kara Sea. This spring there was unusually little ice in the Arctic north of Europe. Navigation on the west coast of Spitsbergen was open early in May, and according to the Christiania newspaper *Aftenposten* a steamer reached Vardö in the first days of May from Archangel without encountering a single bit of ice in the White Sea. There is no previous record of the west coast of Spitsbergen and of the White Sea being open so early.

A wireless message from the *Sviatogor* received in Christiania on June 21 announced the finding of the *Solovye Budomirovich* by the *Sviatogor* and the rescue of her full complement, all of whom were taken aboard the British vessel. Details of the later part of the drift will be awaited with interest.

CHARLES RABOT

HUMAN GEOGRAPHY

Atmospheric Conditions Which Affect Health. In the *Quarterly Journal of the Royal Meteorological Society* for July, 1919 (pp. 189-207), Professor Leonard Hill, of the University of London and the Medical Research Committee, contributes an unusually interesting and valuable article on "Atmospheric Conditions Which Affect Health." He begins by raising the question whether the ordinary meteorological records really measure the conditions which chiefly influence mankind. Under ordinary circumstances barometric pressure, "which is measured with such refinements of accuracy," has practically no effect upon human health or feelings, as Hill demonstrates by experiments in deep-sea diving and in closed chambers. The proportion of carbon dioxide and of oxygen in the air also has no importance in producing discomfort or ill health except under circumstances far more extraordinary than those of the most poorly ventilated mines or offices. The old ideas as to the exhalations from human beings and the supposed toxic poisons thus produced "have been swept away by the overwhelming evidence of physiological research. . . . The victims of the Black Hole of Calcutta died from heat stroke, not from poisonous vitiation of the air by the exhalations of the crowd." Ionization and the production of ozone may perhaps have some effect in making some air "alive" and other air "dead," but this is by no means proved. "It is the cooling and evaporative power of the atmosphere and the radiant heat of the sun, or other source of radiant energy, which have a colossal effect on our comfort and well-being, and it is these factors which require to be measured by the student of hygiene."

As a means of measuring these factors Dr. Hill has devised the "katathermometer," an instrument which measures the speed with which a thermometer drops 5°F. upon exposure to the air after being heated to 100°. This instrument, when dry, sums up the combined cooling power of radiation and convection; when covered with a wet

film of muslin, it measures the effect of these two conditions, plus the cooling effect due to evaporation. It is unquestionably a most useful instrument and ought to be used widely for regular daily observations.

Some of the conclusions which Dr. Hill derives from his katathermometric studies are highly suggestive and of great practical importance: "The expectation of life of the purely industrial population among those who survive over 15 years is 49 to 50 years; of the purely agricultural population, 67 years. Were the agricultural population better housed and better fed their expectation would be, I believe, more like 87 years. The sheltered indoor life of those who work in warm rooms and live in stuffy tenements does not protect from but increases the incidence of consumption and other diseases." . . . "The common people seek to save, and, in truth, destroy life, by avoiding cold and shunning exposure to bad weather and by confining their children within doors and limiting their exercise—this they often do for the sake of keeping clean and untorn the garments, while weakening the bodies, of their children." . . . "*The ordinary indoor conditions of this country [England] approximate to outdoor conditions in such a humid tropical climate as Ceylon, admittedly an enervating climate to Europeans.*" [The italics are Hill's.] . . . . "Two hours a day of open-air exercise fully compensates for sedentary work in warm enclosures, keeps a man perfectly fit, and secures an enjoyment of life and good temper which no indoor recreation can give." . . . "I attach great importance to the radiant energy which pours into us when out of doors, and I say the open fire or gas-fire giving radiant energy is the right method of warming in our misty climate." . . . . "The ideal spring day out of doors gives us sunshine, a warm ground, and cool moving air. These are the conditions we want to imitate in our rooms." Presumably the gas-fire here suggested means one where the fumes go up the chimney and thus cause circulation of the air.

If such are the conditions in England, which the reviewer is growingly convinced to be the most favored of all countries so far as the effect of climate upon human health is concerned, what shall we say of the United States? Every argument for outdoor life which applies in England applies with redoubled force here—where the danger of respiratory and nervous diseases is distinctly greater.

In spite of its general excellence Dr. Hill's work needs amplification and amendment in certain respects. For example, so far as one can gather from the present article, he relies too much on mathematical deductions and not enough upon facts of observation, or rather, although he has made many observations and experiments with the katathermometer, he seems to correlate these with the conditions of health theoretically rather than by actual statistics of energy, disease, and death. Perhaps this seeming weakness will disappear in the fuller publication which is soon promised.

Again, his statements as to the climate of the United States are not quite convincing. The net cooling power of the atmosphere, so he says, is considerably greater in England than in Washington, "whence it follows that the British require an ampler diet than the Americans of the United States—a question of fundamental importance in food rationing times, which the American physiological experts were at first inclined to settle against us." Dr. Hill seems to overlook the fact that Washington is by no means typical of this country and has on the whole a rather poor climate. The majority of the people of the United States live where the climate is cooler, more variable, and more stimulating. In this connection it is noticeable that, although Dr. Hill by implication lays much emphasis upon the value of variability in promoting health, he does not specifically recognize this highly important factor.

The chief respect in which Dr. Hill's work needs amplification arises from the fact that for each climatic condition there is an optimum or most favorable level, so to speak, above or below which the effect is less and less favorable. In England more harm is done by too much humidity than by too little. Having carried on his investigations in such a climate, Dr. Hill gives the erroneous impression that dryness is everywhere desirable. Yet the evidence of millions of deaths proves the contrary. In the hospitals of Boston, for example, after operations performed in unusually dry weather the number of deaths rises about 20 per cent above the average and about 40 per cent above the number when the operations are performed under conditions of favorable humidity, such as prevail perhaps one-fifth of the time.

In spite of these criticisms Dr. Hill's paper is of uncommon value. In an old and well-established subject it is easy to satisfy the critic, but in a subject, like this, which breaks new ground there are bound to be many inconsistencies and many points which demand further study. Such a paper is especially valuable as a stimulus to others to plow in the same field.

ELLSWORTH HUNTINGTON

The Origins of Civilization. Recent numbers of the *Scientific Monthly* have contained several contributions of geographical interest. One of these, a series of articles by Professor J. H. Breasted of the University of Chicago, discusses the origins of civilization (Vol. 9, 1919, 289-316, 416-432, 561-577, Vol. 10, 1920, 86-105, 182-209, 249-268). He begins by a discussion of the geographical conditions of the ancient world, especially Egypt at the dawn of civilization. Then from about 5000 B. C. he follows the course of civilization down to the days of the Greeks. His presentation is unusual and correspondingly interesting because it departs from the ordinary historic method of dealing only with rulers. He tells about the entire life of the people and about their relation to their environment. One of the most interesting features is a series of diagrams showing the evolution of different types of architecture, such as the pyramids and the cathedrals of Europe, from their simplest forms to their complex culmination. Another diagram worthy of careful study shows the comparatively steady progress of civilization in Egypt and Babylon and the irregular progress in Europe.

Professor Breasted ranks as a leader among historians who appreciate the geographic background. In a recent address (The Place of the Near Orient in the Career of Man, and the Task of the American Orientalist, *Journ. Amer. Oriental Soc.*, Vol. 39, 1919, Part 3, pp. 159-184; noticed in the *Review*, Vol. 8, 1919, pp. 285-286) he has presented an unusually strong and persuasive plea for co-operative investigation along various lines, including history, archeology, geography, and anthropology. Geographers would do well to read this address, for it gives a new appreciation of the relation of their science to other lines of effort.

ELLSWORTH HUNTINGTON

EDUCATIONAL GEOGRAPHY

The Extension of Meteorological Instruction. The emphasis which was laid upon the practical importance of a knowledge of meteorology during the war will inevitably lead to a general increase of popular interest in this science and to its more extended teaching. The war demonstrated the need of meteorological training in numerous ways, notably in forecasting, in aviation, and in artillery firing. The American Expeditionary Forces had their own meteorological observers and forecasters. The men who enlisted in the air service, either in the Army or the Navy, were given courses of lectures in meteorology as a part of their "ground school" training. And the artillery officers were instructed in the most essential facts regarding the temperature and the direction and velocity of the wind at various altitudes above the earth's surface. The U. S. Weather Bureau gave preliminary instruction, which was completed in France, to some two hundred engineers and other scientists. The Signal Corps of the Army established a School of Meteorology in Texas to train several hundred meteorologists for service overseas. A course in meteorology was included in the work of the Students' Army Training Corps. In these various ways the subject of meteorology was brought conspicuously before large numbers of men during the war, and the stimulus thus applied should surely lead to a much wider inclusion of the subject in the course of study offered at our higher institutions of learning.

Soon after hostilities ceased the *Monthly Weather Review* (Vol. 46, 1918, pp. 554-567) published a valuable series of papers on meteorology as a subject for study, which should prove very useful to all present and prospective teachers and students of the subject. The Weather Bureau deserves credit for including this symposium in its most popular publication just at that time. The articles are all of immediately practical use and should stimulate and aid in the more general introduction and the better teaching of meteorology in American colleges and universities. In the first paper, "How Meteorological Instruction May Be Furthered," Professor R. DeC. Ward takes the ground that two things are necessary. First, united effort on the part of those who are already in a position to give instruction in meteorology to send out students who will, in their turn, carry on that instruction. And, second, as meteorology has at present a recognized place in very few of our colleges and universities, teachers of physics, of geology, of geography, and of other sciences, who have any interest in meteorology, should make it their business to develop meteorological courses as a part of their own work. A discussion of "Collegiate Instruction in Meteorology," by Dr. Charles F. Brooks, contains many excellent practical suggestions as to the content of an elementary course in meteorology, of college grade. Three outlines of courses of lectures in meteorology are given. There are many suggestions as to the taking of daily observations and the graphic presentation, in a simple and vivid form, of the results of such observations. Brief comment is also made on the textbooks which are useful in this work.

Professor Oliver L. Fassig gives an account of the work which was done in the Signal Corps School of Meteorology at College Station, Texas, of which school he was chief instructor and director. At the time of the signing of the armistice, about three hundred men who had been trained at Weather Bureau stations and at the School of Meteorology in Texas had been sent abroad. About two hundred men were assigned to a score or more of the flying fields, artillery and ordnance camps, balloon schools and radio detachments in the United States. Twenty-five men were transferred to the Navy, for duty in connection with the development of the hydrophone, an instrument designed to detect the presence of submarines.

The series of articles here referred to has been reprinted in pamphlet form, and should come into the hands of all present and prospective teachers of meteorology.

In a later number of the *Monthly Weather Review* (Vol. 47, 1919, pp. 169-170) Dr. Charles F. Brooks summarizes the results recently obtained regarding the present extent of collegiate instruction in meteorology and climatology in the United States. The data were secured in reply to a questionnaire sent by Commissioner P. P. Claxton, of the Bureau of Education, to the presidents of colleges and universities in this country. Dr. Brooks says: "It is to be regretted that there are only three universities in the country where research in meteorology is specifically encouraged, and that even the semblance of a thorough course in elementary meteorology is given at only one in ten of the institutions of higher learning in the country."

GEOGRAPHICAL NEWS

Obituary

Major Robert Hollister Chapman of Washington, D. C., died of pneumonia in New York City on January 11, 1920, at the age of fifty-one. He was widely known as a topographical engineer through his connection with the U. S. Geological Survey, which he joined as a youth of fourteen and continuously served for over thirty years. He did map work for the Survey in the Adirondacks of New York, in the Rockies near Butte, Montana, in the High Sierras of California and in the Death Valley region of California and Nevada. The latter work was noteworthy by reason of the difficult desert conditions overcome. In the Taft administration he had charge of Glacier National Park, which he also mapped.

In 1909 and 1910, at the request of the Canadian Geological Survey, he was detailed in Ottawa for the purpose of introducing American methods of surveying and mapping. The triangulation of Vancouver Island was initiated under his direction. In 1915 he explored the Big Bend of the Columbia River in British Columbia and in 1919 the region southwesterly from Yellowhead pass.

During the war, as a Major of Engineers (Reserve Corps), he was assistant to General Theodore Bingham in connection with the defenses of New York City and in the production of airplane maps.

He was a member of the American Geographical Society and of the Royal Geographical Society and at the time of his death was Secretary of the American Alpine Club. He was an enthusiastic mountaineer and a skillful cartographer.

Howard Palmer

Note

Mr. Wallace E. Whitehouse, of the University College of Wales, Aberystwyth, calls attention to several inaccuracies in the note on "A Relief Model of Wales" in the February *Review* (pp. 141-142). Contrary to the implication of the note the whole model had been completed at the time of the publication of the handbook in 1915. Only 10 of the 66 blocks of the model were described, as is pointed out on p. 22 of the handbook, in order to keep the handbook of a small size and low price. Mr. Whitehouse was not responsible for the whole of the modeling work. Professor H. J. Fleure directed it in the early stages, and later Mr. Whitehouse took charge and was ultimately responsible for the modeling of 34 blocks and the revision of the other 32. The note speaks of the "apparently artificially softened modulation of the blocks." This is more apparent than real. The plates in the handbook are halftone views of highly glazed cement blocks, and all who have had experience of photographing such objects appreciate the difficulty of getting an accurate photograph for reproduction purposes.

GEOGRAPHICAL REVIEWS

Science and Politics

Victor Branford and Patrick Geddes. **The Coming Polity: A Study in Reconstruction.** xvii and 264 pp.; maps, ills. (The Making of the Future.) Williams & Norgate, London, 1917. 8 x 5 inches.

On the surface this is a plea for the application of the method of science in political thinking. As such it is noteworthy. It merits approval also for its appeal that the work of LePlay should receive wider recognition at the hands of English-speaking students of geography.

As projected, the book is introductory to a series "scientific in method and prospective in outlook." One is curious to know, however, whether science is supposed to intrude itself in the present volume. The procedure actually followed seems to be, in the words of the authors, a search for clues to causes carried out by "wandering to and fro between metropolitan capitals and their provincial cities, with the formulae of Comte and LePlay in mind, and not forgetting those of Darwin" (p. 151). In the same spirit Comte is commended as "a kind of naturalist who went about peering into societies past and present, discovering beneath all disguises and mutations his four perennial types" (p. 23).

The authors seem to move in a dream world under the guidance of a science and a history of their own invention. "May not the city be the long-sought missing link between animal and human evolution?" (p. 153). "Without continuous revitalizing [by the periodic fair], the spiritual organs of a city wither and formalize, or ferment to active degeneracy . . . . To this city of evils there comes from time to time the Good Shepherd to seek and to save that which was lost. And from it flees Christian, the Pilgrim, in search of the Celestial City of his dreams" (p. 143). To these regionalists, the shepherd on the hillside is the veritable savior of society: "it is only in the pastoral life that self-sacrifice develops directly from the occupational disposition, in highest sanctity of moral elevation" (p. 124). They have similarly amazing labels for all classes: "the hunter is the man of imagination" (p. 122); "it is the peasant who is *par excellence* the builder" (p. 131); the philosopher is kin "with the dreamy and dreary loafer, with the restless and careless tramp, rustic or urban, as the case may be" (p. 117).

This is not science. The book might be described as the result of an effort on the part of belated mystics to create a "regionalistic" religion out of the incompatible teachings of Auguste Comte and Frédéric LePlay. Frederick J. Teggart

The Economic History of Australia

T. A. Coghlan. **Labour and Industry in Australia from the First Settlement in 1788 to the Establishment of the Commonwealth in 1901.** Vol. 1, viii and 587 pp.; Vol. 2, vi and pp. 589-1185; Vol. 3, v and pp. 1187-1789; Vol. 4, v and pp. 1791-2449; index. Oxford University Press, London, New York, etc., 1918. $33.00. 9 x 6 inches.

This is a work of very considerable volume and value but one difficult to classify. The author says that while it is "a history of Labour it is not a history of Australia." However, his definition of "labor" is so liberal that these four volumes really contain a topical record of Australian industrial society from 1788 to 1901. American readers would be more interested in the events of the past twenty years—particularly in the field to which Mr. Coghlan especially devotes himself—than those of all the one hundred and thirteen years preceding. Yet Australia's recent legislative experiments, which are mainly what make that country interesting to outsiders, cannot be understood without knowing this earlier period.

Additional value is given the book by the fact that it is the logical fruit of the author's life work. It might be subtitled "The Professional Memoirs of a Statistician," allowing the latter term very comprehensive implications. The Australian states and New Zealand have had superior statistical offices for many years—immeasurably better

than most of those in America. After becoming a veteran in this service in New South Wales, where he was Registrar General for a long period, Mr. Coghlan was Commonwealth Statistician—a position which he held with distinction until promoted to higher duties at London. As administrator and editor successively of the New South Wales Year Book and of the Commonwealth Year Book, he dealt continuously with the subject-matter of his present work. This work is the precipitate of a lifetime of study and labor. He did not go out to find a subject and write it up; the topic intruded itself upon him, and its materials were already accumulated and arranged at his elbow.

This does not mean that the book is a statistical manual or a compilation of official reports. Only rarely does a short and simple tabulation break the continuity of the text. The author's style has literary quality; his chapters are narratives as well as analyses; and his descriptions are enlivened by incidents, anecdotes, and personalities. The volumes are not burdensome to read, though their length, detail, and subject-matter will limit their appeal mainly to the student.

The arrangement is partly chronological and partly topical. These one hundred and thirteen years of Australian history are divided into seven periods, bounded in each instance by a political or economic episode of importance, such for example as the discovery of gold, or the great panic of 1893. Events within each period are discussed by topics, under subject headings varying from period to period in accordance with the country's changing industrial problems and development. Some subjects, like immigration, labor and wages, land laws, and prices, recur constantly; but convict settlement, indentured labor, and factory legislation are naturally not contemporary topics.

Within the field to which he confines himself Mr. Coghlan speaks with authority. He writes without footnotes, documentation, or bibliography—merely acknowledging in his preface the aid received on special topics from three coadjutors. He resembles our own historian, McMaster, in drawing largely upon the daily press; and, for the latter part of the period he describes, he was in many cases the writer of his own archives. His statistics are merely illustrative and descriptive, partly because such treatment satisfies the purpose of the book and partly because data do not exist in many instances for more refined and elaborate methods of presentation. To an American reader there is something parochial in the minute personal detail that characterizes the political chapters. One meets catalogues of names that mean nothing—and deserve to mean nothing—to the outside world; and more than once the reader sees genius lauded whose brilliance must have illuminated a southern firmament from which no reflections reached our northern horizons.

However, it would be difficult indeed to write a work of this magnitude for Australians—who after all are entitled to first consideration—which would be consistently interesting for Americans. In fact for us Mr. Coghlan's work will remain a discursive reference book—a sort of monographic encyclopedia—of the industrial and social *origines* of Australian legislative experiments.

It is hardly practicable here to deal with the periods and topics in detail. But by following any one of the topics, such as the public land policy or the labor supply, a reader quickly catches the antithesis between the evolution of Anglo-Saxon law and institutions in America and in Australasia—a contrast which goes far toward explaining the marked difference in the theories that inspire their respective legislation. Australia and New Zealand were ready-made colonies, founded at a time when Great Britain was a veteran in such enterprises and had conscious theories about them based on past experience. There were theories enough and public discussion enough when America was settled by Englishmen, but our colonies none the less grew up like Topsy. The twist given to Australia's institutions by the fact that it was at first a convict settlement—founded to dispose of persons Great Britain could no longer send to America after we attained our independence—has lasted until today; although the convicts themselves were but a transient element in its history. The original purpose of the settlement made necessary a highly centralized and paternal government. Government control, government regulation, and government aid were the tripod which supported the colony's economic life. Even the individualism of the gold rush did not destroy the collectivist instincts thus begotten. To be sure it was a self-reliant collectivism of pioneers and frontiersmen; but none the less absolutely different from the individualist and self-dependent habits of thought and action which inspired our own pioneers and settlers. Our decentralized society was largely rural while our political institutions were forming; that of Australia was predominantly urban almost from the outset. Our government was a running machine before the industrial revolution, while Australia's was erected under the tutelage of a highly industrialized mother country. So in Australia social ideals imported from a nation maturer than our own confronted physical conditions quite as primitive as those which existed in America. The result has been a unique application of new-country initiative to Old World problems.

These volumes do not cover the period when compulsory arbitration had become fully established as a method of dealing with labor conflicts; but the author allows himself to trespass diffidently upon this subject in his discussion of labor legislation between 1893 and 1901. He says that while "it is certain that the Courts and the Wages Boards do much to smooth the relations of employers and employed . . . events have shown that Labour will not always accept the awards of arbitration nor refrain from striking, and the employers only are bound by the awards" (pp. 2115-2116). Having been in operation only during a period of rising prices and wages "it has yet to be seen how arbitration will work in a period of trade depression and a failing labour market" (p. 2116).

All in all the book is a worthy one—indispensable for a library affording really important source materials upon geography and modern social and economic history. Its private purchasers will probably be chiefly specialists in land or labor legislation or economics, and they will seldom have to go beyond its covers for any information they may require regarding Australia during the period before the formation of the Commonwealth government.

VICTOR S. CLARK

RAMBLES IN THE CATSKILLS

T. M. LONGSTRETH. **The Catskills.** 321 pp.; map, ills., bibliogr., index. Century Co., New York, 1918. $2.50. 8½ x 5½ inches.

A charming book, fitted to enhance the enjoyment of all intelligent dwellers or sojourners among these fine hills. It is not a mere guide or reference book but a work worth while as a bit of literature, very pleasant to read, full of humor and incident as well as of solid fact. With all this lightness of touch, the whole work is permeated with the essence of the Catskills, the things that bring over 100,000 visitors every year from Greater New York to rest a while, exercise "that tired feeling," and go home rejuvenated.

The author sets forth all kinds of truth about these mountains. He has walked everywhere among them and almost photographs hill and vale in words. If he talks of their delicate charm he also says that in the dog days, when New York City is hot, the Catskills are hot too. The fact is that the average summer daylight temperatures of the Catskill plateau, where people live, are only about ten degrees lower than those of the city. But the air is dry, children run around on the hottest days in the shade, and complete relief comes after sunset.

THE PHYSIOGRAPHY OF NORWAY

H. W. AHLMANN. **Geomorphological Studies in Norway.** Maps, diagrs., ills., bibliogr. *Geogr. Annaler,* Vol. 1, 1919, No. 1, pp. 1-148; No. 2, pp. 193-252. Stockholm.

The Swedish Society for Anthropology and Geography, founded at Stockholm in 1877, has hitherto been known to us chiefly through its journal, *Ymer,* now in the 40th year of publication. The newly established *Geografiska Annaler,* "the purely scientific publication of the Society, . . . will be an international periodical, written mainly in the great world-languages, but also in the Scandinavian languages, devoted to general geography, and especially to the geo-physical investigations which at the present time flourish so greatly in Scandinavia. The students of all countries are welcome as contributors . . . . *Ymer,* on the other hand, will be published exclusively in Swedish and will give accounts of studies and investigations of consequence in the wide field of geography, especially paying attention to what lie within the domain of economic geography."

The first two numbers of the new *Annaler* are largely occupied by an analytical study (published in English) of Norwegian land forms by Ahlmann, who spent ten months of 1916 and 1917 in observational travel. He adopts the prevailing view that the highlands of Norway represent a generally worn-down surface, afterwards upheaved, and gives special attention to the conditions and results of its later dissection. Here he distinguishes two incomplete cycles of normal erosion, during the first of which mature valleys were excavated beneath the highlands, and during the second young valleys were incised in the floors of the mature valleys. The mature valleys are found to be less mature when followed up to their heads; but they are more mature when followed down to their mouths; there they are described as so greatly widened as in large measure to consume the intervening highland areas, which are there of moderate altitude. Thus the "coast plain" of Norway, which Reusch ascribed to wave work, is interpreted by Ahlmann as of subaërial origin. Glaciation is recognized as having excavated

the deep fiords and as having strongly modified the coastal lowlands. The large importance recently given by Sederholm to faults in the production of fiords is denied.

Ahlmann's essay is well illustrated by half-tone views, maps, and sketches; and an elaborate bibliography is given at its close. As is usual in analytical essays, geographical description here occupies less space than argumentative demonstration, and the past thus comes to hold a larger share of the reader's attention than the present. This relation is likely to prevail in such studies until the results of analysis are so well assured as to be generally accepted. For example, twenty years ago the origin of hanging lateral valleys was in discussion; now their origin is settled, and they are referred to as well-understood elements of certain landscapes. Progress in this respect is rapid. We may expect that our successors thirty or fifty years from now will use the results of our argumentative analyses in their everyday descriptions. In the meantime, the results gained at present would be more generally appreciated and used by economic geographers, historians, and others, if they could be gathered in a continuous descriptive statement which would satisfy most readers, but from which any reader might turn to the analysis if he wished to learn the evidence upon which the account of any item is based.

Regarding Ahlmann's explanation of the coastal lowlands, it may be noted that wave work should expectedly have had some share in carving the margin of the highlands; for the upheaval of the pre-existent lower lands appears to have been of a warping nature, probably accompanied by depression along the ocean border; and upon the shore line thus initiated the waves of the Atlantic must have accomplished a good amount of abrasion while the rivers were maturing their valleys in the interior and widening them to the confluent lowland of today near the coast. The two processes should therefore not be regarded as mutually exclusive, although the shares that they may have had in wearing down the uplifted land mass may have varied from place to place. Around the present coast of southern Norway wave work may have been weak during the cycle of erosion in which the mature valleys were excavated, for at that time a large part of the North Sea may have been dry land; hence the lowland there may be largely ascribed to valley widening. But along the mid-western coast, where the ocean waves came in unobstructed from deep water, a certain share of the lowland may be plausibly regarded as of marine origin, particularly in districts where the present ascent from the lowland to the highlands is abrupt. This possibility is given less consideration than it appears to deserve.

It is gratifying to read Ahlmann's statement in his preface: "During my journeys, and also in the treatment of the observations made in their course, I have followed the general principles of geomorphology which have been worked out in America. . . . . Indeed I consider that, without the conception of 'cycle,' it is scarcely possible to bring any order into, or obtain any unity in, the complex of heterogeneous topographical elements that compose the Norwegian land of the present day." W. M. DAVIS

THE MOORS OF FINLAND

A. K. CAJANDER. **Studien über die Moore Finnlands.** Maps, diagrs., ills. *Fennia.* Vol. 35, No. 5, pp. 1-208. Helsingfors, 1913-15.

This report on the moors of Finland is supplied with two maps in color on the scale of 1:20,000 and a map of the route traveled in the botanical and ecological exploration of this country of forest, lakes, and moors, with rivers emptying into the Gulf of Bothnia, the Gulf of Finland, and the White Sea. The author, one of the foremost Finnish botanists, has had abundant experience in making similar surveys in Siberia and elsewhere in Europe. The work consists of an introduction, which gives the author's general point of view, a general part (pp. 5-85), and a special part (pp. 89-208).

Moors are defined differently according to the viewpoints of those who make a study of them. If defined from the geological viewpoint, they are natural places where peat is found. The biological, or rather ecological, definition is that a moor is a plant formation consisting of peat-forming plants. Dr. Cajander all through his report lays especial emphasis on the ecological phases of moors, and several pages are devoted to an introductory discussion of the various types of moors, which have been described and named by ecologists who have made telmatology their special line of investigation. The current views on high moors (*Hochmoore*), low moors (*Flachmoore* and *Niedermoore*), transitional moors (*Zwischenmoore*) are analyzed in several pages of footnotes. After sifting the evidence, the author concludes that in Finland there are four moor types, as follows:

(1) Gray moors: treeless, normally more or less wet and overflowed, without moss ricks (rounded, elevated parts of the moor), poor in shrubs (except *Oxycoccus* and

Andromeda); the moss vegetation, as far as present, consisting of peat mosses (*Sphagnum*). In calcium-poor regions.

(2) Brown moors: treeless, normally more or less wet and overflowed, without moss ricks, moderately poor in large shrubs; the moss vegetation, as far as present, consisting principally of so-called brown mosses (various *Amblystegia, Hypnum trichoides, Paludella, Meesea, Cinclidium*, etc.). In calcium-rich regions.

(3) Shrub moors: little, or scarcely, overflowed moors with or without ricks, with more or less abundant vegetation of moderately tall shrubs; the moss vegetation being formed principally of Sphagneae and the forest growth, nearly always present, consisting principally of more or less twisted and dwarfed pines (*Pinus silvestris*). In calcium-poor and calcium-rich regions. The ground water more or less stagnant, or very slow-flowing.

(4) Tree moors: forest moors, the woody growth consisting of spruces (*Picea excelsa*) and broad-leaved trees, the pine unimportant; the moss vegetation consisting normally of peat moss and bear moss (*Polytrichum commune*) or with true mosses in increasing numbers. The ground water more or less distinctly flowing. In calcium-poor and calcium-rich regions.

The origin of the Finnish moors is to be attributed to the filling of shallow lakes and lake basins with encroaching plants and to the invasion of moor-forming plants into flooded lands or into forests. The principal moor-forming plants of the first category are *Equisetum fluviatile, Carex rostrata, Heleocharis palustris, Hippuris vulgaris, Alisma-plantago-aquatica, Sparganium simplex, Lysimachia thyrsiflora, Menyanthes trifoliata*, and a number of hydrophytes, as *Lemna minor, Utricularia vulgaris*, and other water plants of the genera *Potamogeton, Nymphaea*, and *Nuphar*. Much less frequently, and principally only in southern Finland, appear *Sparganium ramosum*, two species of *Typha, Glyceria aquatica, Scolochloa arundinacea*, and *Carex stricta*. The remains of all these plants with the mud-covered earth contribute to the formation of the layers of peat. The other method of moor formation by the flooding of river valleys with water is described at some length by Cajander with the aid of maps in the text.

In the development of the moors a variation in the amount of moisture is very frequent. This is observable in the growth of a moor from a shallow lake and in the invasion of a forest by bog mosses and typical moor plants. *Sphagnum fuscum* is one of the principal bog mosses active in raising the ground-water level in the formation of moss ricks. The growth of the Scotch pine on the gray moors, shrubs moors, and cotton-grass moors has been studied and plotted by the author in relation to the development of these kinds of moors. The moor complex is then described in great detail, with the aid of outline and colored maps, for the high moors of different geographical types.

The special part of the monograph deals with the types of moors in Finland; and each section, under the headings Gray Moors, Brown Moors, Shrub Moors, and Tree Moors, is introduced with a definition of each type printed in italics. The principal and characteristic plant species are given in detail for each type of moor. Some of the floristic details are listed under the heads of grasses, herbs, shrubs, and trees. The pages fairly bristle with the enumeration of the principal plants which enter into the different moor associations. Each of the twenty plates has two exceptionally clear photographic reproductions of the different kinds of Finnish moors.

The whole monograph is an exceptionally good piece of synecological investigation, and the author has succeeded in throwing considerable additional light upon a much confused subject. It would seem almost necessary to call a convention of ecologists and botanists in order to discuss the nomenclature of moors and bogs with the hope of bringing order out of chaos. Cajander has done a service in discussing the origin, nature, and constituent plants of the Finnish moors without emphasizing the distinction between high moors and low moors and in using other distinctive terms.

JOHN W. HARSHBERGER

THE FORMATION OF CORAL REEFS

T. W. VAUGHAN. **Corals and the Formation of Coral Reefs.** Maps, diagrs., ills. *Ann. Rept. Smithsonian Instn. for 1917*, pp. 189-276. Washington, D. C., 1919.

The first part of this paper presents an excellent summary of the anatomy of the coral organisms and of the ecological conditions under which they live. The results of many experiments by Vaughan, Mayor, and others on the conditions affecting coral growth are cited. Among these may be mentioned the relation to temperature, to light, to the salt content of the ocean, the capacity of corals to withstand exposure to the air, the method by which they catch their food and the nature of their food sup-

ply, the rearing of coral larvae, the duration of the free-swimming stage, and the rate of growth. The conditions for the vigorous development of reef-forming species are indicated.

A definition of a coral reef is proposed, and the necessity of distinguishing this type of structure from one composed primarily of calcareous algae is emphasized. An important section is devoted to varieties of limestone which frequently have been confused with coral-reef rock. These are oölitic limestones, shell sand, and limestones made chiefly of foraminiferal and bryozoan tests. Coral reefs are often associated with such deposits, but make up only a small fraction of the total mass. The distribution of the existing reefs is discussed. The reef-forming species are divisible into two biogeographic groups, the Atlantic and the Indo-Pacific. In the early Tertiary, the reef faunas of both oceans were identical, but the development of a land bridge between North and South America during the middle and later Miocene caused the differentiation, which became complete by the Pliocene.

The closing portion of the paper consists of a critical analysis of the important explanations of the origin of the reefs: (1) the Darwin-Dana subsidence theory; (2) the solution-erosion theory of Semper and Murray; (3) the still-stand theory; and (4), the glacial control theory. The solution-erosion theory is shown to be untenable, for solution is not important either in the lagoon or in the reef channels, and in the lagoon itself sedimentation predominates over erosion. The Darwin-Dana theory is discussed in detail especially with reference to the evidences of submergence. Vaughan concludes that "fringing reefs seem uniformly to have unconformable basal contacts," and that "they may form during either emergence or submergence" (p. 237). Barrier reefs and atolls develop on "antecedent flattish basements during and after submergence. . . . This generalization applies to fossil as well as to living reefs" (p. 237). The supporting platforms are believed to have been formed by various processes prior to the appearance of the reefs and independently of coral agencies. The nature of these processes and the manner of submergence have no bearing upon the later growth of the reefs. The formation of atolls by progressive changes in subsiding fringing reefs, as postulated by the Darwin-Dana theory, is theoretically possible, but Vaughan does not believe that actual examples exist.

The writer agrees with Daly that glacial controls have been of the utmost importance in the present development of the reefs. The supporting platforms, which are pre-Pleistocene in age, were subjected to certain modifications by marine abrasion during the lowered sea levels of the glacial period. In certain areas, as in the Fijis, in the Bahamas, and along the Florida coast, reefs are growing on "coastal flats that have been brought below sea level by tilting" (p. 238). From this Vaughan infers that "general submergence because of deglaciation is concomitant with local crustal deformation" (p. 237).

NORMAN E. A. HINDS

SECULAR CHANGES IN RAINFALL

C. E. P. BROOKS. **The Secular Variation of Rainfall.** Map, diagrs. *Quart. Journ. Royal Meteorol. Soc.*, No. 191, Vol. 45, 1919, July, pp. 233-248 (discussion, pp. 246-248). London.

It has again and again been asserted that meteorological records present no evidence of secular changes in rainfall. In the present paper Mr. C. E. P. Brooks, however, vigorously attacks this idea. His method is to use departures of rainfall from normal as one factor and the length of time before or after the central year of a given series of observations as the other factor. In this way it is possible to use the exact mathematical method of correlation coefficients. Mr. Brooks has gone to the great labor of working out some two hundred of these coefficients. On this basis he has prepared a map of the world showing the general tendency of the rainfall during the period since observations are available. While there are many coefficients too small to be significant, there are enough large ones to indicate certain general tendencies. The map shows: (1) a marked increase of rainfall in the main land mass of eastern Europe and northern and central Asia and a hint of the same thing in Canada; (2) a general decrease in low latitudes from about 40°N. to nearly the same latitude in the southern hemisphere; and (3) a hint of increased rainfall in the far south. Although the whole matter is still in its initial stages, Mr. Brooks seems to have demonstrated that opposite kinds of changes in rainfall are actually taking place in different parts of the world in cycles longer than any for which complete records are yet available.

ELLSWORTH HUNTINGTON

FREE-AIR CONDITIONS

W. R. GREGG. **Average Free-Air Conditions as Observed by Means of Kites at Drexel Aerological Station, Nebr., During the Period November, 1915, to December, 1918, Inclusive.** Diagr., bibliogr. *Monthly Weather Rev.*, Vol. 48, 1920, No. 1, pp. 1-11.

Two years ago, Mr. Gregg, in charge of the aerological division of the Weather Bureau, published a summary of the free-air conditions above Mt. Weather, Virginia (*Monthly Weather Rev.*, Vol. 46, 1918, pp. 11-21). The data on winds, pressures, temperatures, and densities proved to be so valuable in the aviation and artillery branches of the army that a similar summary of the observations made by means of kites over the Great Plains was undertaken and is now published. A few striking features are worth mention. Although March is warmer than February, April is colder than March at all levels from 1.5 up to 5 kilometers at least; in winter the temperature at a height of 2 kilometers is higher on the average than at the surface; wind velocity at all seasons practically doubles in the lower 500 meters; and, no matter what the surface wind direction, the wind at 5 kilometers is usually from between southwest and northwest, the north-of-west directions aloft being associated with surface winds around to northeast, and the south-of-west directions aloft being above surface winds southerly or easterly as far as east-northeast.

Little attempt is made to discuss the data, except to make clear their degree of accuracy and how the averages were made and to bring out the salient features of the tables and some contrasts with data obtained in Blue Hill and Mt. Weather kite flights. Obviously, the Weather Bureau's daily operation of kite stations is rapidly adding a third dimension to American climatology.

CHARLES F. BROOKS

CORRESPONDENCE

The University, Sheffield, England,
February 18, 1920.

To the Editor of the "Geographical Review":

In his interesting article on Norwegian work in Spitsbergen published in the *Geographical Review* for October-November, 1919, M. Charles Rabot has allowed his well-known admiration for Norway to distort his outlook on the work of British mining companies in Spitsbergen. But since his facts are avowedly taken from Norwegian sources, not in all cases of recent date, this is intelligible.

Certain historical statements, however, require correction. M. Rabot disputes the position of Spitsbergen as a *terra nullius* up to the recent date of Norwegian sovereignty. In this he is wrong. Norway-Denmark's sovereignty of Greenland could not, as he asserts, embrace Spitsbergen when once it was discovered that Spitsbergen was not part of Greenland. This fact was established early in the seventeenth century and disposes of all Danish claims. Moreover, M. Rabot seems unaware that Norway, Sweden, and Russia, discussing the Spitsbergen problem in 1912, proposed a settlement in which the first words were "Spitsbergen skal forbli *terra nullius*" (Spitsbergen shall remain a *terra nullius*). Furthermore at the Spitsbergen Conference held in 1914 the participating powers met on the distinct understanding that Spitsbergen was a *terra nullius*. This was pointed out in my article on Spitsbergen in the *Geographical Review* for May, 1919. These historical facts are of importance in their bearing on the recent decision of the Paris Conference to give Norway sovereignty in Spitsbergen. This sovereignty is not operative in non-Norwegian estates, which to all intents and purposes are extra-territorial.

Yours faithfully,

R. N. RUDMOSE BROWN